FEBRUARY 6, 1961

American Machinist / Metalworking Manufacturing

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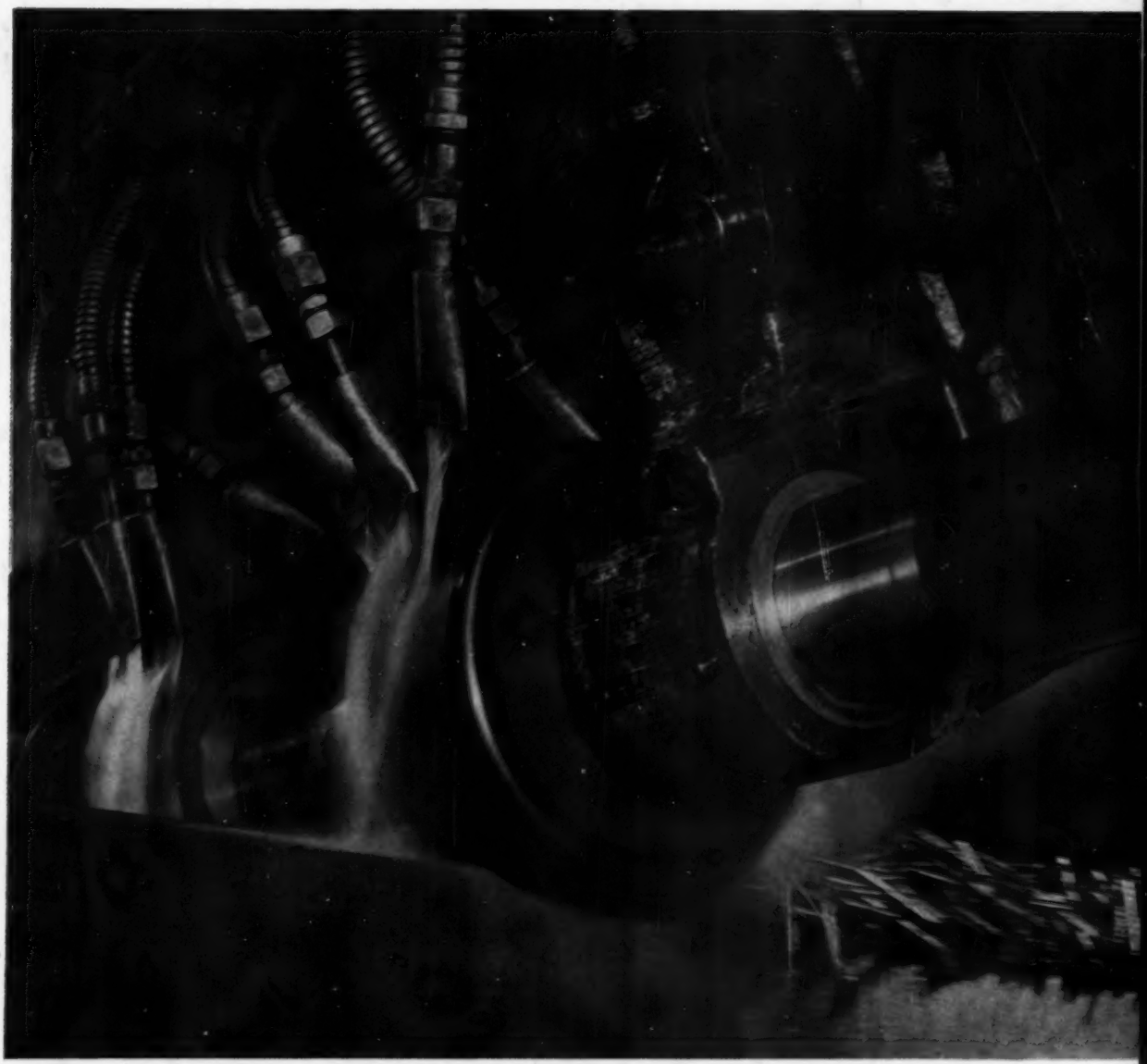


Slab cutters climb milling on SAE 4145 steel—see page 1

BASICS OF PRODUCTION SOLDERING

Special Report, page 99

UNIVERSAL GRINDING

Reversing the Cost Trend

by Clifford G. Menard
Consulting Engineer
The Heald Machine Company

Just about everything costs *more* these days—*much* more than it did 10 or 15 years ago. And when we first decided to build a completely new Universal Internal Grinding Machine that would not only "hold the line", but actually *reverse* the upward cost trend, many an eyebrow was lifted in disbelief. Some said it couldn't be done. Others felt that major economies could be made only with a big sacrifice in performance.

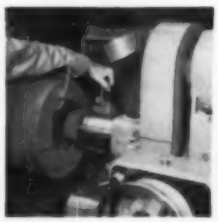
Admittedly, the task was not a simple one. In order to cut costs without cutting quality, we had to make a complete re-evaluation not only of the basic machine design, but of every step of our manufacturing operations as well. But we found that a large number of cost savings could be made, by utilizing the latest advances in machine design and streamlining production methods to eliminate as many manual operations as possible. Although most of the savings were relatively small individually, they added up to a major reduction in manufacturing cost.

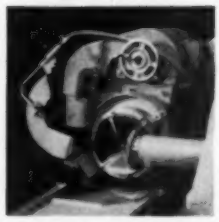
This better, more versatile general purpose grinder costs about *half* as much as comparable machines today, and *less* than similar machines (with fewer features) cost in 1947!

Here's how some of the savings were made. The use of hydrostatic table ways eliminated an expensive booster arrangement in the hand table feed. An externally-mounted valve "package", on the front of the machine, simplified the hydraulic power arrangement and eliminated all but essential units in the hydraulic system. And with all hydraulics outside of the machine, the base is mechanically stronger and less expensive to produce because there are fewer holes and less surface area to finish. Furthermore, simplified basic engineering and construction make it possible to build this standard machine with standard arrangement on a STOCK basis resulting in shorter deliveries.

These and other refinements enabled us to make the 273A a truly universal machine with greater capacity, easier operation, and inherent precision that holds tolerances within .0001″ in normal production and .000050″ in special cases. Yet its 1947 price tag puts it within the economic reach of virtually every plant or machine shop, regardless of size.

Here's the new Model 273A Universal, on display at the 1960 Machine Tool Exposition. On a steel test piece, the O.D., a straight bore, a tapered bore and the face were ground to size within .0001″ at a single chucking.





Workhead swivel of 90°, several wheelhead positions, permit I.D., O.D. and rotary surface grinding of parts up to 12″ in diameter. Vari-speed workhead drive is infinitely adjustable from 75 to 450 rpm.

Ask your Heald Engineer for the complete UNIVERSAL story. Then compare its performance and cost with any other similar machine available today!

THE HEALD MACHINE COMPANY
Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts

CIRCLE 151 READER SERVICE CARD

COVER:
Climb cutting with half-side HSS cutters, 55 sfpm on SAE 4145 steel, at Baldwin-Lima-Hamilton. Coolant is TL-131 Johnson's wax

American Machinist / *Metalworking Manufacturing*

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METALWORKING REPORT

. . . what's new and significant in manufacturing techniques and materials—

direct from our own staff and round-the-world news bureaus

HEAT TREATING . . . Carbon content is held within 0.02 to 0.04% in 40-ft-high gantry furnace at Commercial Steel Treating Corp, Detroit. The secret is Perkin-Elmer's (Norwalk, Conn) chromatographic unit, called the Furnace Analyzer, which **automatically analyzes and controls four atmosphere components**—in this case, CO_2, CH_4, N_2, and CO. A **portable unit** can monitor endothermic and gas generators.

FINISHING . . . Adhesive quadruples polishing time because it lets wheels operate at 19,000 rpm without failing. New Chemlock adhesive—developed by Hughson Chemical Co, Erie, Pa—bonds the hub and rubber body of contact wheels so firmly that **the rubber will tear before the bond fails.** These speeds reduced polishing time on some parts **from 3 min to 42 sec.** One coat of type 203 is used as a primer, and a coat of type 220 is the adhesive for both stainless and aluminum hubs.

INSPECTION . . . Metalworking is borrowing reliability programs from missile work, as evidenced by the report of several General Motors' divisions at the recent SAE meeting in Detroit. With the increasing complexity of products, **manufacturers need assurance that acceptable levels** of reliability are achieved. The independent program, directly under a division general manager, **includes four phases:** design, test, production, and service. **Interest by other metalworking firms** was displayed at the recent Seventh National Symposium on Reliability and Quality Control in Philadelphia.

CUTTING . . . Holes bored oversize can sometimes be reclaimed by roller burnishing. When an auto manufacturer bored an aluminum transmission part 1.127 instead of 1.125 in., Madison Industries, Providence, came to the rescue. They suggested: **Deform the bore to 1.123 in.** with a 28-pitch X-Press tap. After roller burnishing, bore was 1.125 in., and **roundness improved from 0.001 to 0.0004 in.**

INSPECTION . . . Large diameters (ten feet and more) will be measured with optics, one expert predicts. Indicating and recording devices will function automatically, and **measurement will occur while the diameter is being machined.** A roundup of conventional and advanced measurement techniques starts on p92.

COMPONENTS . . . Solid aluminum-tin bearings, developed in France, **withstand a load of 3 tons/sq in. for over 100 hr** without measurable wear or failure. Chill-cast bearings of this alloy cracked after 48 hr, and conventional copper-lead bearings after 6 hr. The continuous-cast material (6% Sn, 94% Al) **does not need the usual steel backing.**

NOTICE TO SUBSCRIBERS

Delay in receipt of your copy of the AM/MM Buyers' Guide (Jan 23, '61) was caused by a series of heavy snowfalls combined with a rail strike that threw extra traffic on the roads. Delivery of printed forms to the bindery was delayed several days.

The editors wish to apologize to subscribers for any inconvenience this caused. At the same time, we wish to express our appreciation to all the people involved, particularly Blanchard Press, for the special efforts put forth under trying conditions to get this 760-page Buyers' Guide issue in the mail with minimum delay.

CUTTING . . . World's largest diamond knife, 3/16 in. long, has a **cutting edge radius of 12 carbon atoms.** (Points of today's better diamond phonograph needles, only 0.0007 in., are 10,000 times as large.) **The DuPont development aids in the extrusion of cellophane films:** Hopper lips can be 10 times smoother. Also, the knife will cut ultra-thin metal slices for electron microscope inspection, which gives **images 250 times larger** than light scopes now used for inspection.

MANUFACTURING CONTROL . . . Now it's an incentive plan for inventors. During 1960 IBM awarded $275,000 to 250 employees for inventions. This year, any invention rated "outstanding" by the company will earn $1000. **Another system rewards multiple inventions:** five earn $1000; thirteen earn $1500. As many as 40 inventions in a year **can earn the inventor $8000.**

CUTTING . . . Tool breaks chips to desired size with high-frequency **side motion adjustable from 25 to 200 cps** with dial. This controlled cleaving action not only fragmentizes chips; it also **reduces horsepower required for a given cut by up to 50%** over that of a fixed toolholder. Because chips are sheared off by an oscillating motion, this device, developed by Cleveland Hobbing & Machine Co, tends to **wipe off continuous feed marks** on its back stroke. In later operations, grinding time and wheelwear at finishing is usually improved.

FORMING . . . Combination bending roll shapes sheets, angles, T's, flat, and round bars —all quickly and accurately. Ordinarily, two machines are required for this range of work, but this combination angle and initial type bending roll—developed by Hendley & Whittenmore Co, Beloit, Wis—**has conventional rolls between journals, plus outboard roll heads and guide lines.**

FINISHING . . . Paper replaces cloth as backing for coated abrasive rolls commonly used for lapping crankshaft journals. In sustained testing by Behr-Manning, who developed the material, the **paper rolls have out performed cloth** in micro-inch readings, and other respects, at **considerably lower cost.** Because the 50-yd rolls run in oil, but must not slip, an anti-slip sizing is applied to the backing.

WELDING . . . Precise preheat temperature and uniform heat distribution are features of a **shop-made hot plate** built at Allis-Chalmers Mfg. Co. and described by W A Schumbacker at the Plant Maintenance & Engineering Show. Powered by two welding generators, the 60-in. plate holds steam-turbine diaphragms at **600 ±25 F during a 24-hr welding operation.** For further details see page 83.

Continued on next page

Coming in AM/MM

- *Productivity Indexes*
- *Rolled Worm Threads*
- *Welded Honeycomb*

METALWORKING REPORT...

MATERIALS . . . "Zytel" nylon resins have been declared safe for food handling and processing. Recent Food and Drug Administration ruling allows these DuPont resins to be used in such products as food and soft-drink dispensers. It has **also been tested in dairy equipment such as milking machines** plus vacuum and conveying lines.

CUTTING . . . Optical comparator sets tool depth and diameter to 0.0001 in. Developed by Pratt & Whitney Co, West Hartford, Conn, the instrument combines gage blocks and end measures for even inch settings with **super micrometer head** to give increments of an inch. It will also **check tool runout and cutting edge condition.**

FINISHING . . . Voltage automatically increases as coating thickens in hard anodizing operation at Douglas' Nike Hercules plant in Charlotte, NC. A special rectifier (100 v, 1000 amp) from Hanson-Van Winkle-Munning **maintains 25 amp/sq ft** during the entire 75-min anodizing cycle. Voltage, which starts at 10 to 20 v, must be **raised up to 85 or 90 v.**

INSPECTION . . . Automatic quality control of output of 30 machines can be done by a new monitoring system, called Amficon, made by AMF. A sensing head, attached to each machine, sends **signals to a master console** which records the machine's output during a two-minute sampling period. Simultaneously, a **meter prints out deviations** from norms.

FORMING . . . Four stroke lengths on one press are possible because of a new design featured by Dechert Dynamics Corp, Palmyra, Pa. Instead of riding on the crankshaft, the **pitman is mounted on an eccentric tapered bushing.** Position of bushing can be changed and locked at any of four marked positions.

American Machinist / *Metalworking Manufacturing*

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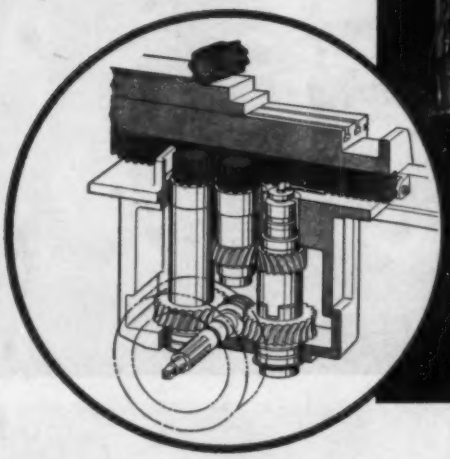
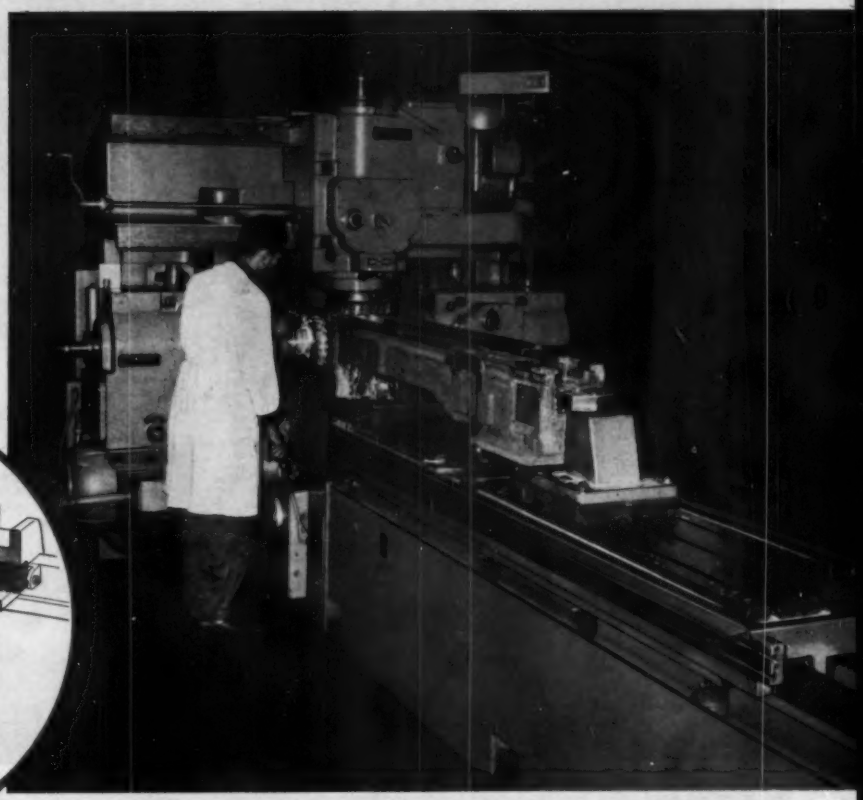
CINCINNATI

Always a smooth, powerful cut on the HyPowermatic

. . . . with exclusive

HYDRAMECH TABLE DRIVE





Three spindle heads, each taking a heavy cut on a lathe bed, are evidence of the smooth, powerful cutting capacity of CINCINNATI HyPowermatic Milling Machines. The one illustrated here is a No. 430-2614 Triplex, having 80 hp drive to the spindles. (Photo courtesy "Industrial World")

It's a fact! These husky CINCINNATI HyPowermatics subdue the toughest production milling jobs with a smoothness and ease that defy comparison. One reason is HYDRAMECH, Cincinnati's exclusive table drive unit that applies the driving force exactly where it belongs—*directly to the table, immediately beneath the cutting force*—and not through long leadscrews that drive table brackets. The result is uniformly smooth cutting action on *every* CINCINNATI HyPowermatic regardless of size.

HYDRAMECH Table Drive's infinitely variable table feeds (up to 150" per minute) can be changed during milling by a simple twist of a dial . . . or automatically, with the variable feed attachment. HYDRAMECH also embodies Cincinnati's exclusive backlash eliminator, permitting both conventional and climb milling.

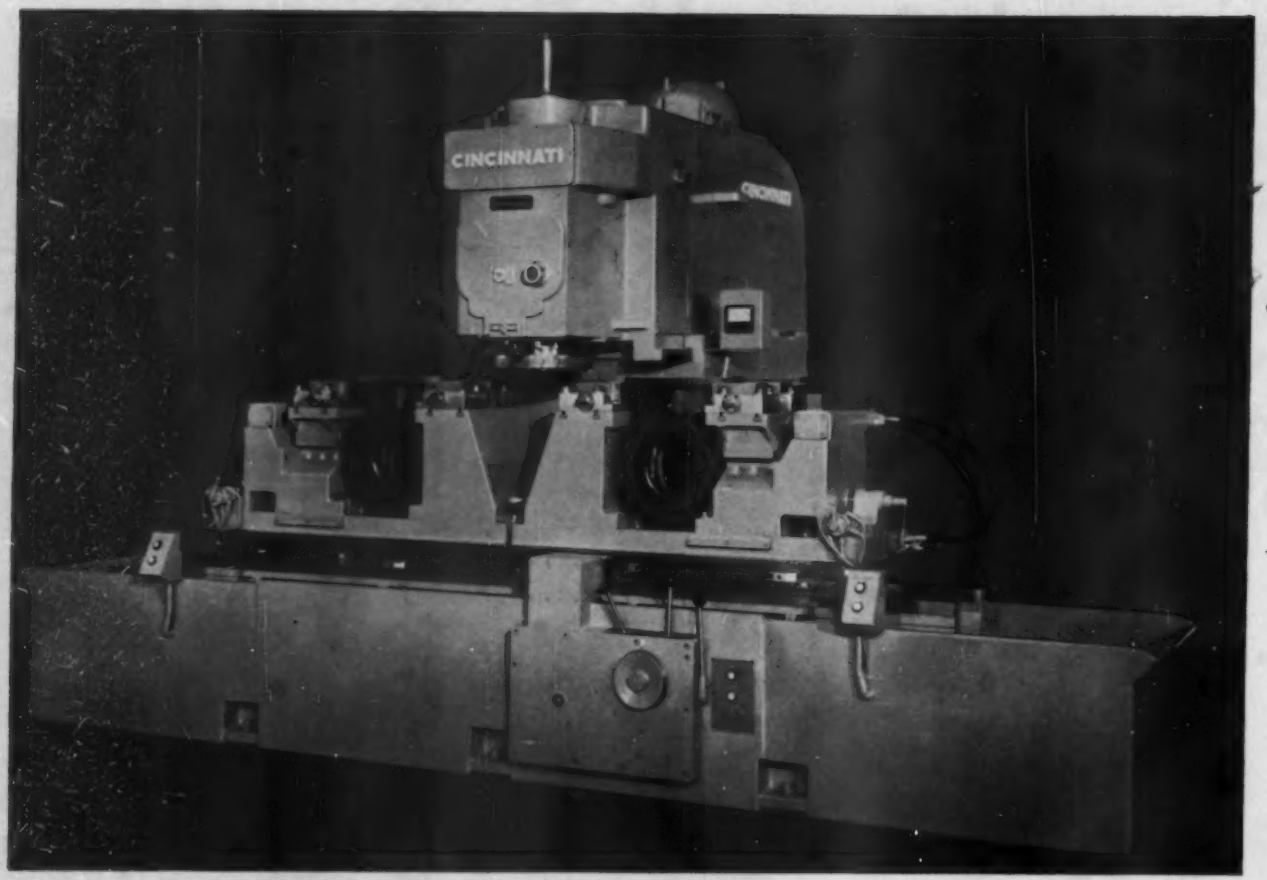
Other cost-reducing features include: a wide range of automatic two-way table cycles; 16 spindle speeds; only three-gear contacts in spindle drive; Dynapoise vibration damping overarm. You'll be interested too in CINCINNATI HyPowermatic's extended range of applications, as discussed on the two pages following. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

CINCINNATI®

MILLING MACHINE DIVISION

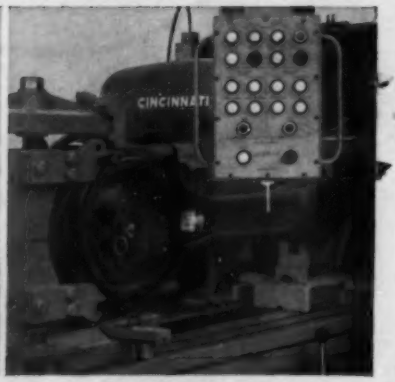
KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES • CUTTER AND TOOL GRINDERS • ELECTRICAL MACHINING EQUIPMENT

CINCINNATI HyPowermatic



HyPowermatic with Vertical Spindle, tooled up to mill faces on gate valve bodies. Reciprocating cycle allows one fixture to be loaded while the other part is being machined. 25 ft./min. feed rate.

Quad-Duplex HyPowermatic is equipped with a pair of powerful vertical spindles in addition to the standard duplex horizontal spindles. In one feed cycle eight surfaces of yoke brackets are milled.



Duplex HyPowermatic with automatic five-position quill advance mills the bosses on connecting rods. Rough and finish operations are performed automatically in a milling cycle of 5.9 minutes.

CINCINNATI

BUILDERS OF FINE MACHINE TOOLS: KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES •

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

CIRCLE 155 READER SERVICE CARD

Standard and Complementary Units

provide high productivity and versatility at standard machine cost

Why not consider the HyPowermatics for your production milling? You may find that they can be engineered to give you low-cost special machine performance. Cincinnati builds the HyPowermatic in plain, duplex, tracer controlled plain or duplex, rise and fall plain or duplex, 50 sizes each. And these standard machines can be combined with a variety of complementary units to give you unusual cost-reducing arrangements, such as HyPowermatics with:

- close-coupled spindle carriers
- vertical and angular spindle heads; many styles and combinations, including adjustable angle
- ram mounted spindle heads
- fixed height or adjustable bridge type rail support for vertical spindle heads

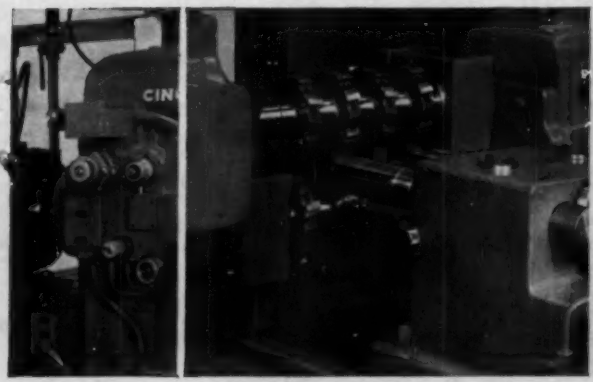
Now is the time to look at your shop's heavy duty automatic milling machines which are perhaps productively obsolete. You may be surprised to see how much you can gain—in added production and lower cost per part—by modernizing with CINCINNATI HyPowermatics, built up from standard and complementary units to suit the job. A few examples are illustrated here, and complete information is presented in catalogs M-1909-3 and M-2020-2.

Investigate today. Write or telephone **Milling Machine Division, The Cincinnati Milling Machine Co.,** *REdwood 1-2121.*

Standard CINCINNATI HyPowermatic Milling Machines

No. of Sizes	Types	Table Traverse	Feed hp	Spindle hp
50	Plain	2—14 ft.	3—5	5—50
50	Duplex	2—14 ft.	3—5	5—50
50	Plain Rise and Fall	2—14 ft.	3—5	5—50
50	Duplex Rise and Fall	2—14 ft.	3—5	5—50
50	Plain Tracer Controlled	2—14 ft.	3—5	5—50
50	Duplex Tracer Controlled	2—14 ft.	3—5	5—50

Write for Catalogs: M-1909-3 for 300, 400 and 500 Series HyPowermatics; M-2020-2 for 100 and 200 Series HyPowermatics.



Duplex HyPowermatic performing "over and under" milling of keyways on hydraulic steering gear connectors. Eight cutters mill both sides of two parts in one cycle.

Tracer-Controlled HyPowermatic with extra long bed mills spring bars for generator motors. HYDRAMECH Table Drive assures uniformly smooth cutting action.

CUTTER AND TOOL GRINDERS • ELECTRICAL MACHINING EQUIPMENT

CINCINNATI
MILLING MACHINE DIVISION

CIRCLE 156 READER SERVICE CARD

how's this for high-speed hobbing?

WORK PIECE					HOB (1 start)				Pieces per Load	Method*	Time per Piece	Pieces per Grind	Cut
Dia. Pitch	No. of Teeth	Helix Angle	Face Width	Material	Dia.	RPM	Feet PM	Feed					
10	20	15°	1¾"	1040 leaded	3"	500	395	.055"	1	A	2 min. 25 sec.	150	Finish
7	23	13°	¾"	8620	4"	350	370	.100"	2	A and B	59 sec.	240	Pre-shave
5	43	24°	1⅝"	8620	4"	280	300	.100"	2	B	3 min. 45 sec.	80	Pre-shave

** Method A: Diagonal Hobbing. Method B: Step-by-step Hobbing.*

This is the kind of performance you get with

THE FELLOWS-PFAUTER P400 HIGH-SPEED HOBBING MACHINE

HIGH-SPEED HOBBING. Performance speaks louder than words. The examples given above show the results of high-speed hobbing which can cut costs. The figures are taken from the records of typical production runs on the Fellows-Pfauter P400.

DESIGN. The P400 was designed for High-Speed Hobbing, and it features a new basic design. The individual machine elements are of maximum rigidity. The hob head is heavy and rugged, the machine column and bed are of double-wall construction with heavy V-ways and the work table is as large as the maximum permissible work piece diameter. The index worm gear is nearly as large as the work table, and the work support column is of massive construction. All parts of the machine are properly proportioned and of sturdy design to eliminate vibration. The cost is more than justified by the resulting reductions in hobbing times and the increased hob life.

RIGIDITY and CLOSE TOLERANCES. The large size work table and index worm gear and the oversize hob head, which eliminates lead errors caused by hob breakout, are important factors in providing the rigidity necessary to hold work to close tolerances.

COMPLETELY OPEN WORKING AREA. The machine and the work-support columns are of such rigid construction that the hobbing stresses are absorbed without requiring an over-arm. Therefore the working area is easily accessible for set-up and work loading. The automatic retraction of the table from the hob also facilitates changing of work.

SET-UP TIMES and FLOOR-TO-FLOOR TIMES are reduced on the P400 because it has infinitely variable speeds and feeds, rapid traverses for all machine movements, including hob shifting manually by push button, and built-in hydraulics for the operation of the tailstock and simple hydraulic fixtures used on this machine.

AUTOMATION on the P400 is simple and fast. The illustrations show a machine equipped with automatic loading and unloading devices.

GEAR HOBBING COSTS can be cut by high-speed hobbing on a P400 because of the resulting savings in production time, floor space, maintenance and labor.

THE FELLOWS GEAR SHAPER COMPANY 78 River Street, Springfield, Vermont, U.S.A.

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THE PRECISION LINE

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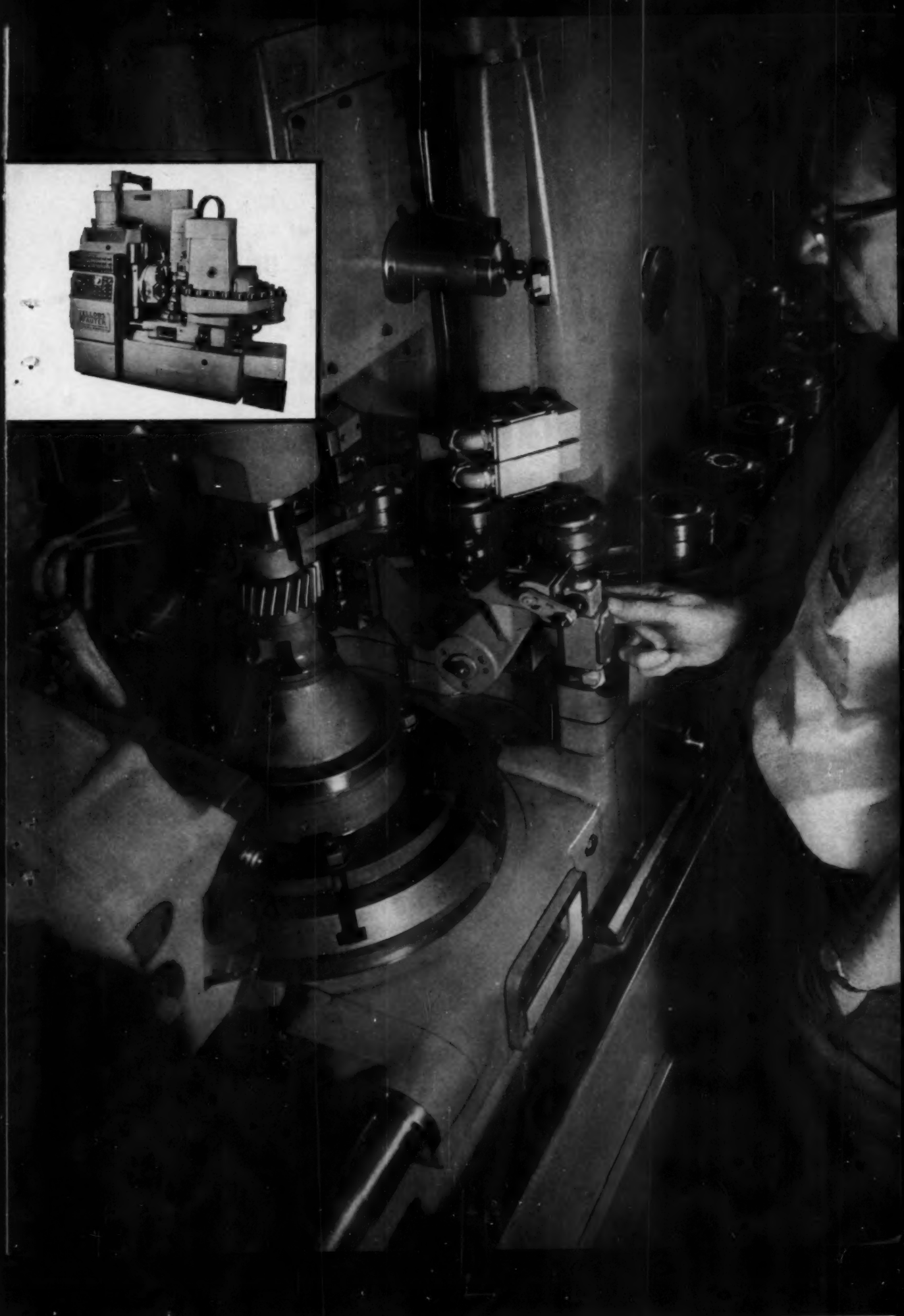
Gear Production Equipment



HIGH WHEEL SPEEDS ?

Over the years Landis has supplied many cylindrical grinders with high wheel speeds... but only to fit the job requirement.

If you need 8500 SFPM on your next Landis grinder, it is available. As always, our engineers will recommend the best speed to grind your workpieces efficiently.

LANDIS

world leader in precision grinders

LANDIS TOOL COMPANY WAYNESBORO, PA.

Pick the one you need . . . there's a G-E Carboloy toolholder for every metalcutting purpose

Designed to do a better job more efficiently, Carboloy toolholders help you get BETTER PROFITS THROUGH BETTER TOOLING

Even the very finest cemented carbide inserts (Carboloy carbides) can't do a decent machining job if the toolholder is inferior.

That's why the Metallurgical Products Department of General Electric has evolved a line of toolholders to do a superior job in every metalcutting operation. Carboloy toolholders get the mileage out of inserts . . . take the headaches out of machining.

Choose from: Lift-O-Matics, with self-raising chip-breaker clamp (positive rake, negative rake – 20 styles, 186 sizes total); Adjust-O-Breakers, with the chip-breaker versatility of *many* toolholders (negative rake – 10 styles, 30 sizes); Tracers (positive rake, negative rake – 8 styles, 19 sizes total); Heavy-duty (8 styles – 10 sizes).*

These, along with the complete line of Carboloy inserts, insert seats, convertible seats, and brazed tooling, are all designed to help you attain "BETTER PROFITS THROUGH BETTER TOOLING." Check with your Authorized Carboloy Distributor today. Or write: *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Ave., Detroit 32, Michigan.*

**Available through Canadian General Electric Company, Limited, Toronto, Ont., and through International General Electric Company Division, General Electric, International, New York, N.Y.*

CARBOLOY.
CEMENTED CARBIDES

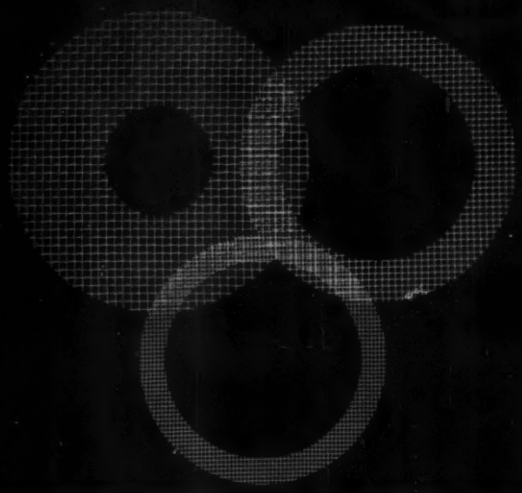
METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

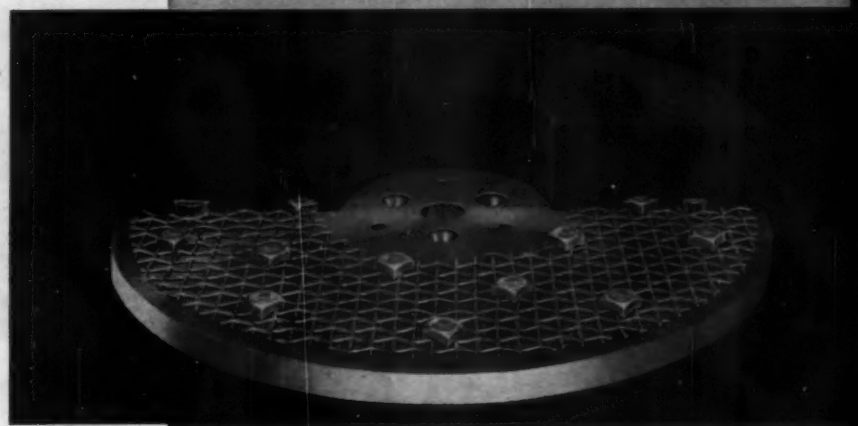
DISC SAFETY AND ECONOMY

with Gardner Wire-Lokt® construction



Heavy steel wire mesh becomes firmly embedded in the abrasive structure, actually forming a part of the abrasive backing.

Special steel anchoring nuts lock securely into wire mesh. In manufacture, abrasive is forced around and under steel mesh and nuts.



Full value is assured because usable abrasive extends right down to Wire-Lokt backing.

GARDNER

abrasive discs

BELOIT WISCONSIN

Fast setup of stroke lengths with adjustable quadrants like this becomes a vital factor in controlling costs when you have a line of 1500 products complicated by widely varying lot sizes and ever changing customer needs.

AT THOR POWER TOOL COMPANY
Aurora, Illinois

5-hour setups permit 300-piece lots on Multi-Spindle Bar Automatics

These Multi-Spindle Automatics set up just like a turret lathe. Spindle drum index is disengaged by lever as shown. Trial cuts made during setup are fed on and off the work without going through the entire cycle.

Fast setup and interchangeable tooling on seven Warner & Swasey Bar Automatics slash costs in complicated small lot situations.

Thor Power Tool finds that a complete setup takes only 5 to 6 hours, or as little as 3½ hours depending on the last job in the machine. These Warner & Swasey Multi-Spindle Automatics are handling lots between 300 and 5000 pieces with an occasional lot as low as 100 pieces. On a 650 piece job, Thor also finds that one operator can easily handle two machines; on a 1000 piece lot one operator runs three machines.

Not only are direct costs reduced, but by eliminating extra operations in other departments, paper work (which costs money, too) is reduced. The easy setup and reliable repeat accuracy simplifies breaking in new operators. In difficult-to-machine metals, Thor finds that the selective feed control lengthens cutter life and that the micrometer cross slide dials speed up tool resetting.

More facts? Call your local Warner & Swasey office, or write Warner & Swasey Company, Cleveland 3, Ohio.

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

WARNER & SWASEY

HIDDEN VALUES in Finkl Products

WHAT'S INSIDE

THIS FINKL VACUUM DEGASSED DIE BLOCK?

There are connecting rods, track links, outboard crankshafts, forged products of aluminum, magnesium, titanium, and a myriad of hot work applications.

There is excellent machineability, fewer tool regrinds, and higher luster in the impression because more than half of the oxidic inclusions and other impurities have been removed.

There is increased forging production with less downtime due to breakage, even under severe operating conditions. This is due to the higher density steel which has been purged of over half of its hydrogen and oxygen—the troublesome gases.

There is the value of over eighty years of experience in the manufacture of forgings, die blocks, and hot work steels.

There is the value of strict quality control through every step from the processing of our own electric furnace steels to the final "okay" in the ultrasonic testing department.

You get more from Finkl in quality products, continuing research, and engineering service. Call your Finkl representative for your forging, hot work die steel, and die block needs.

This mark tells you a product is made of modern steel.

Write to Dept. A, on your company letterhead for free BULLETIN 200. It tells how to care for and get more production out of your Finkl die blocks.

SPECIFY FINKL DIE BLOCKS AND HOT WORK STEELS FOR "IMPRESSIONS THAT LAST"

DIE BLOCKS · FORGINGS · HOT WORK STEELS · ELECTRIC FURNACE STEELS

A. Finkl & Sons Co.

2011 SOUTHPORT AVENUE · CHICAGO 14, ILLINOIS

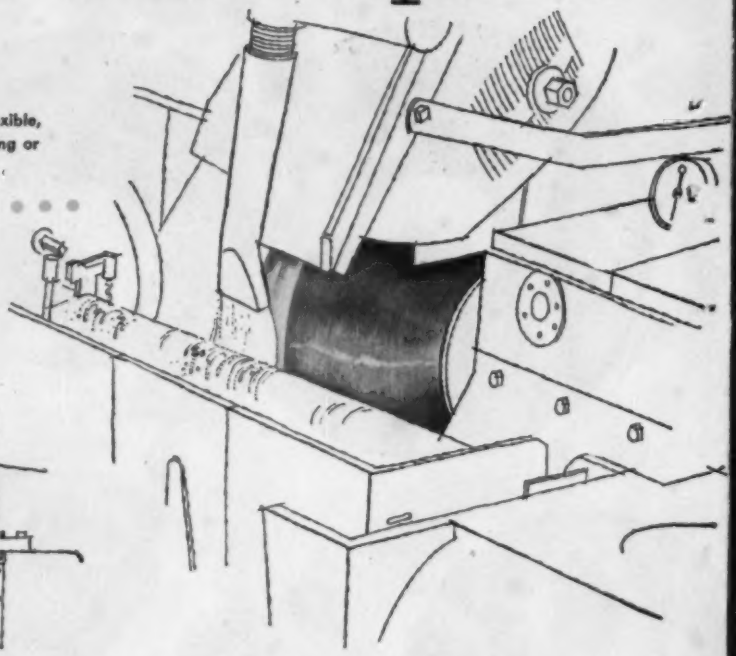
Offices in: DETROIT · CLEVELAND · PITTSBURGH · INDIANAPOLIS · HOUSTON · BOSTON
COLORADO SPRINGS · SAN FRANCISCO · SEATTLE · BIRMINGHAM · KANSAS CITY · MILWAUKEE
LOS ANGELES Warehouses in: CHICAGO · DETROIT · BOSTON · LOS ANGELES

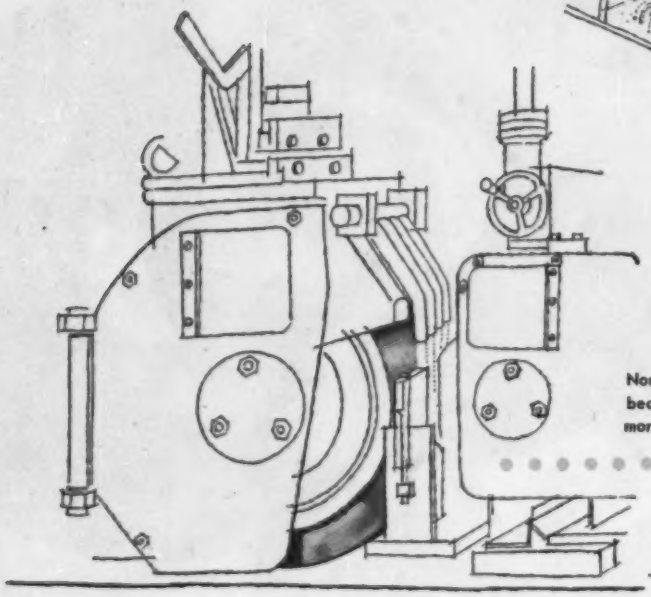
DIAMOND WHEELS by Carborundum are most economical for carbide tipped cutter grinding. Many in-plant tests conducted on the grinding of carbide tipped cutters have proved Carborundum Diamond Wheels superior to competitive wheels in economy and grinding performance. The efficiency and savings indicated by the results of these tests are so outstanding that the details of many of them have been forwarded to Carborundum distributors and salesmen for your reference. Ask the Carborundum representative in your area to show you these facts on his next call. **CARBORUNDUM®**

Announcing:

Higher Wheel Speeds

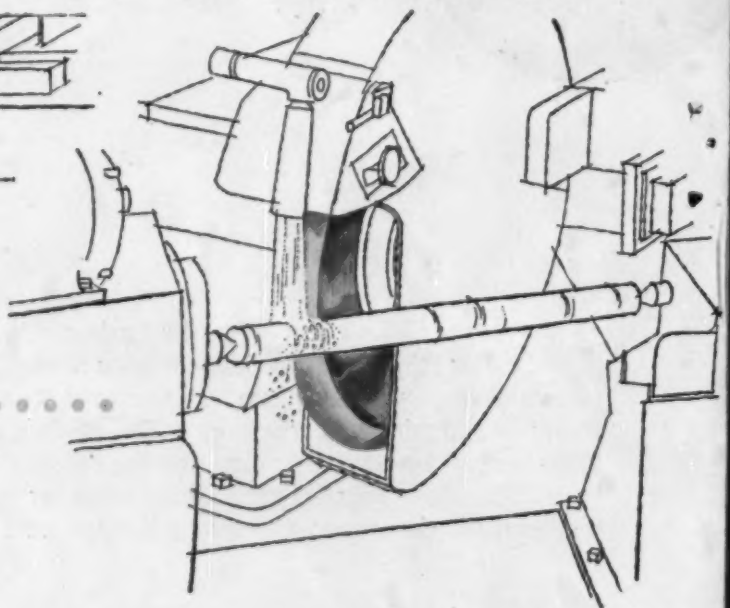
Norton Type CTU cylindrical grinders are fast, flexible, accurate. For single wheel or multi-wheels, roughing or finer finish, plunge or traverse type operations.





Norton No. 2 centerless grinder is outstanding for its straddle-bearing support of grinding and regulating wheels for faster, more consistent sizing.

Norton Type CP-1 PLUNGE-O-MATIC grinder designed solely for automatic plunge grinding, assures low unit cost production through fast, steadily paced action.



NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEAR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

to Speed Production

Norton grinders with Norton grinding wheels at 8500 SFPM grind faster and better, with more savings than ever before.

Norton comes up with this latest advancement only after exhaustive testing of Norton machines and Norton wheels at the new higher speeds.

In test after test Norton machine-wheel teams proved their ability to grind at 8500 SFPM — *not only with safety, but with more advantages than were ever obtained under the previous limitation of 6500 SFPM.*

That's why important Norton cylindrical production grinders — Type CTU, plus the No. 2 Centerless, plus Type CP-1 PLUNGE-O-MATIC® — are now available with wheel speed ranges stepped up to 8500 SFPM.

New Norton High-Speed Production Benefits

Higher Productivity. Increasing SFPM by 30% reduces grinding time by about one-third and increases pieces-per-hour.

Finer Surface Finish. On most cylindrical jobs, the new higher wheel speed means a finer finish. On Norton machines this advantage is now available to you.

Longer Wheel Life. 8500 SFPM cuts down number of wheel dressings needed thereby increasing the production life of the wheel.

Lower Wheel Cost. Longer wheel life means more pieces-per-wheel, longer wheel use per dollar and thus lower operating cost per wheel.

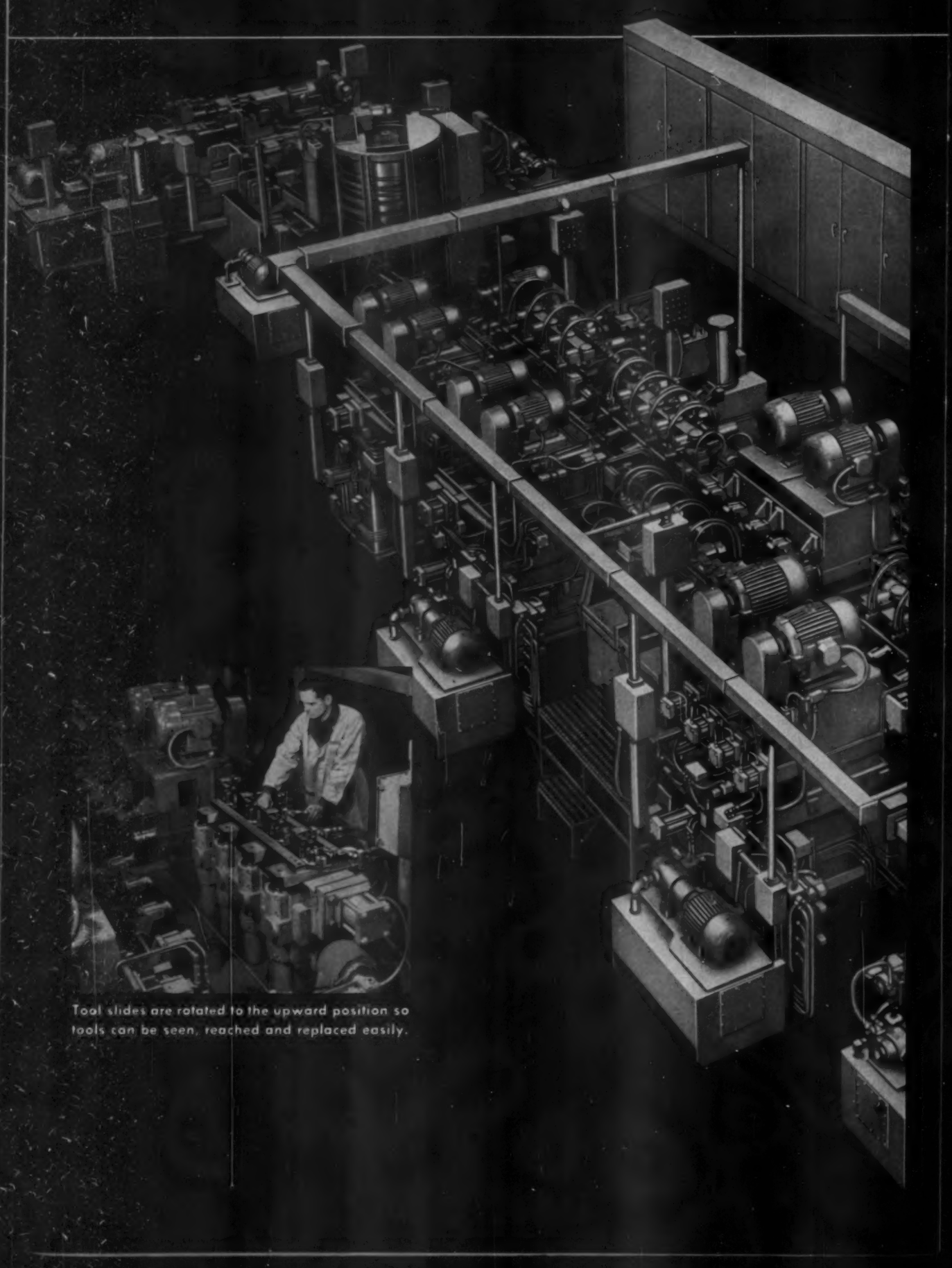
From now on Norton grinders arranged for the new maximum of 8500 SFPM will be so identified by an attached plate. Norton grinding wheels of the types approved and specially tested for the higher operating speed will also be identified to show this approval. For details on how Norton wheels and machines can bring the new high speed advantages to your production — *fast!* — call your Norton Man, a trained Grinding Engineer. Or write to NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. *District Offices:* Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

NORTON

75 years of . . .

Making better products... to make your products better

MACHINE TOOL DIVISION: Grinding and Lapping Machines — G & E DIVISION: Shapers • Gear Cutting Machines • Gear Induction Hardeners

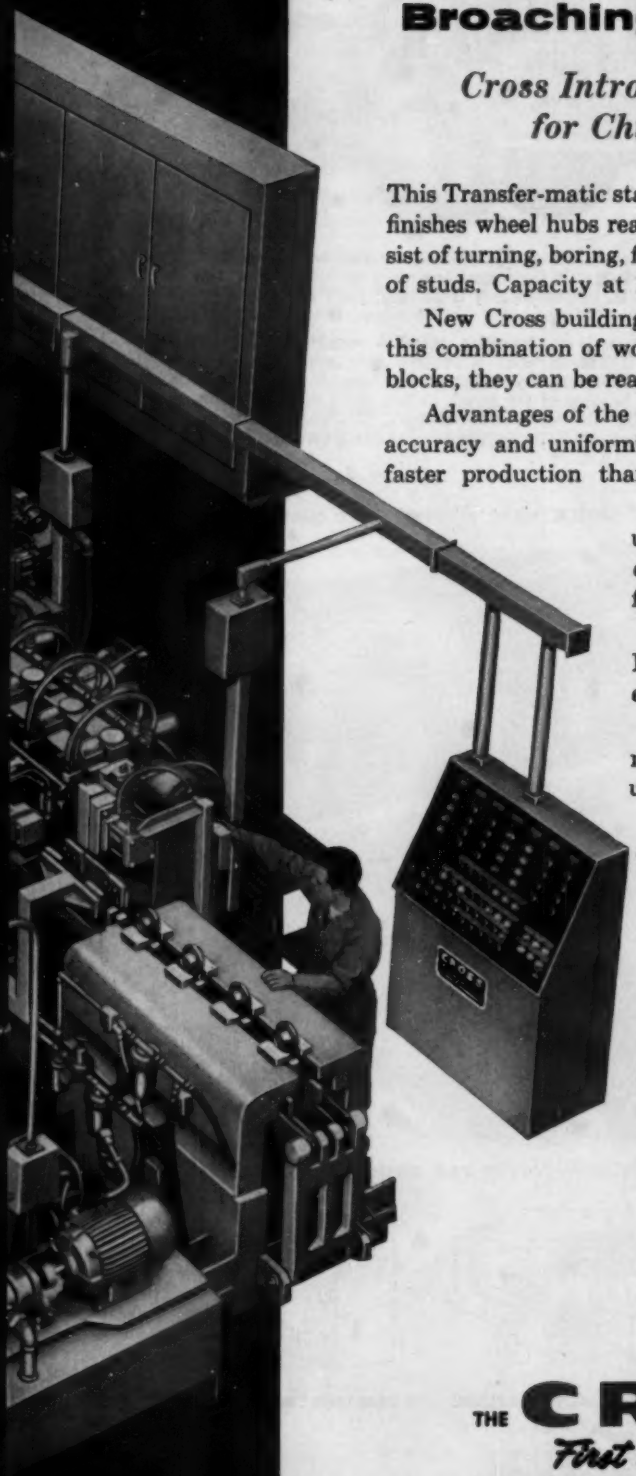


Tool slides are rotated to the upward position so tools can be seen, reached and replaced easily.

Another Automation First by Cross

New Transfer-matic Combines Chucking with Drilling, Broaching and Assembly

Cross Introduces Building Blocks for Chucking Operations



This Transfer-matic starts with rough castings and completely finishes wheel hubs ready for final assembly. Operations consist of turning, boring, facing, drilling, broaching, and assembly of studs. Capacity at 100% efficiency is 200 parts per hour.

New Cross building blocks for chucking operations make this combination of work possible. Like other Cross building blocks, they can be rearranged as requirements change.

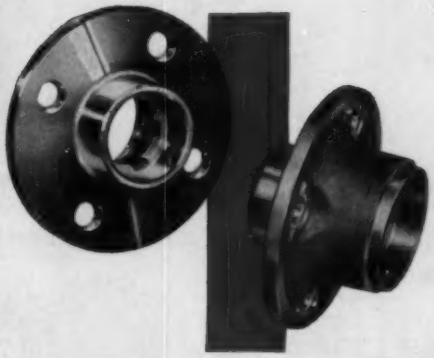
Advantages of the new Transfer-matic include maximum accuracy and uniformity, higher output, less handling, and faster production than conventional methods.

Heavy duty, three jaw chucks are used on the roughing operations but diaphragm types are employed for finishing to avoid clamping distortion.

A work bank between Sections I and II permits independent operation of either one during maintenance.

The new building blocks include a novel slide unit which tilts the tools upward to speed changes.

Cross engineers will gladly discuss details of this Transfer-matic with you.



Established 1898

THE **CROSS** CO.

First in Automation

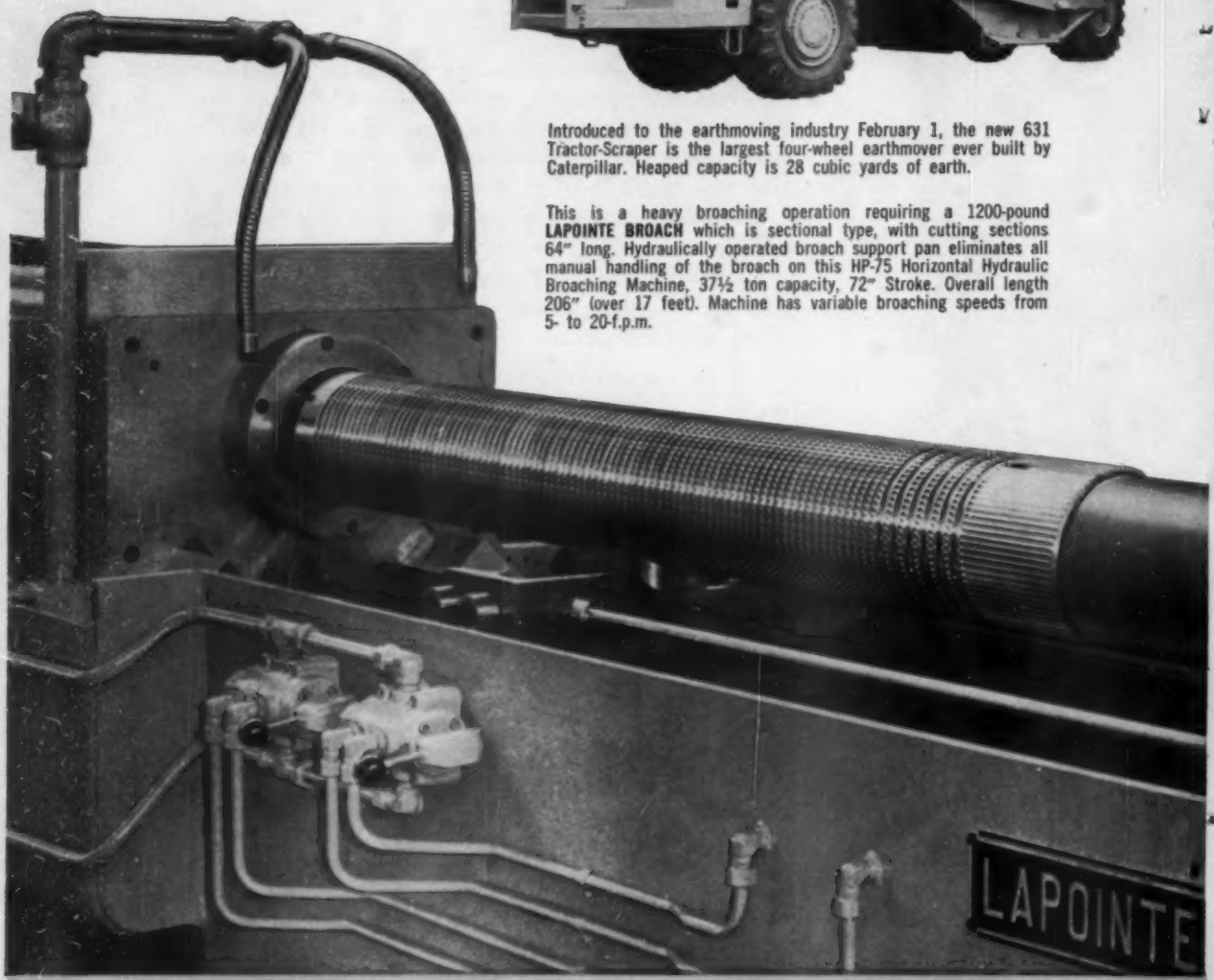
PARK GROVE STATION • DETROIT 5, MICHIGAN

CIRCLE 170 READER SERVICE CARD

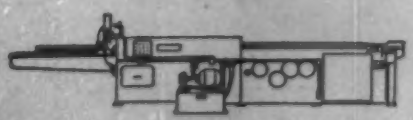
Used in the plants of **CATERPILLAR TRACTOR CO.**

Introduced to the earthmoving industry February 1, the new 631 Tractor-Scraper is the largest four-wheel earthmover ever built by Caterpillar. Heaped capacity is 28 cubic yards of earth.

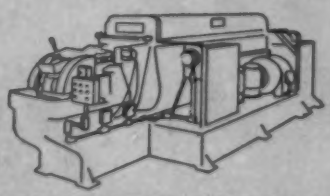
This is a heavy broaching operation requiring a 1200-pound **LAPOINTE BROACH** which is sectional type, with cutting sections 64" long. Hydraulically operated broach support pan eliminates all manual handling of the broach on this HP-75 Horizontal Hydraulic Broaching Machine, 37½ ton capacity, 72" Stroke. Overall length 206" (over 17 feet). Machine has variable broaching speeds from 5- to 20-f.p.m.



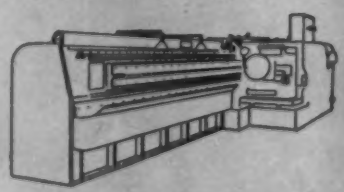
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

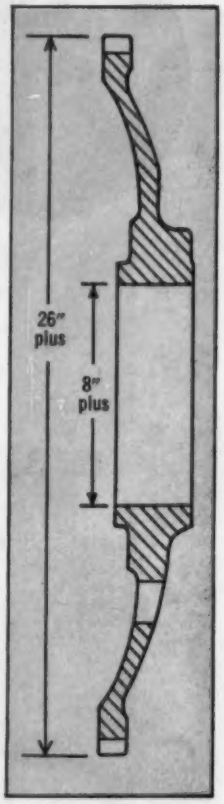
LAPOINTE BROACHING MACHINES

rate an "assist" in making our highways safe!

The big Cat 631 Tractor-Scraper requires big parts. One such part is the 26-inch Hub shown in the section drawing, having the minor diameter and the 79 involute spline teeth Lapointe-Broached from the solid in a steel forging. Even with an I.D. of more than eight inches, and tolerances held extremely close, the broaching is easily completed in 2¼ minutes floor-to-floor time.

You may not be machining such big parts . . . but it's a safe bet that whatever you may be doing by milling, shaping, grinding or other conventional metal-removing method *can be Lapointe-broached for less.* You get a better finish, high production, and a perfect part every time — no spoils.

Comparing all methods of metal removal, the greatest potential for cost reduction exists in the field of *broaching.* Why not investigate? An experienced Lapointe Engineer will gladly call on you at your request.

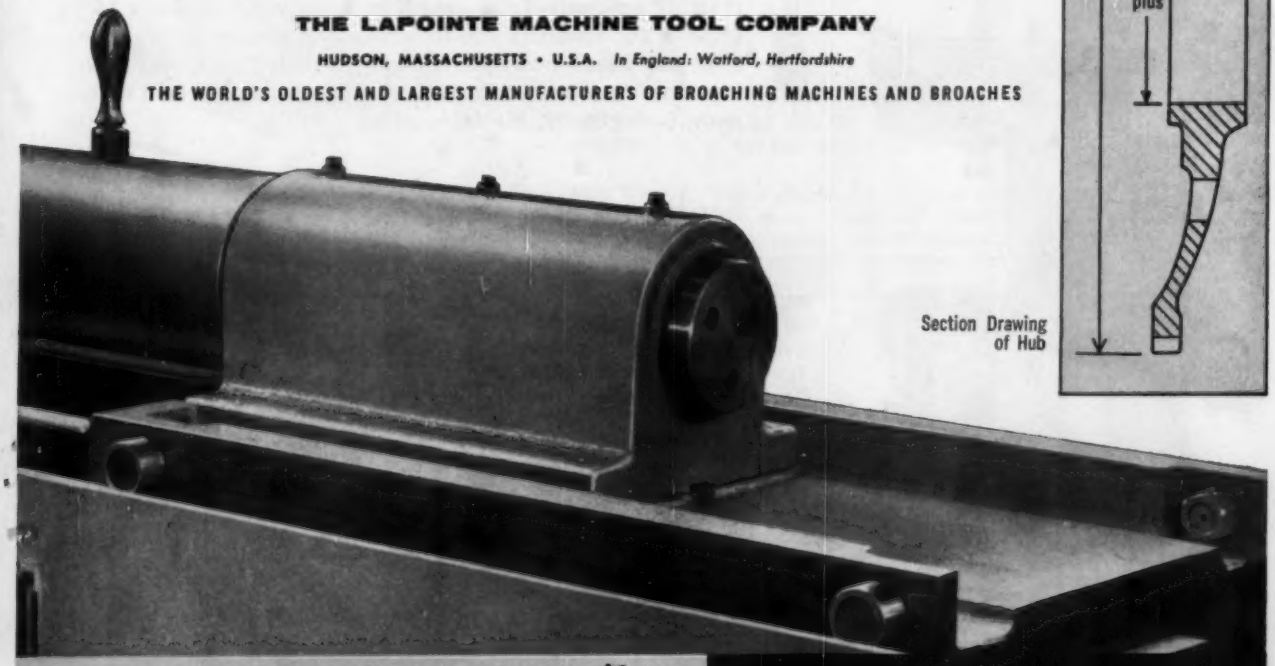


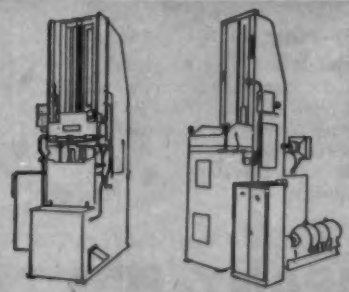
Section Drawing of Hub

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES





VUE-7 VERTICAL PULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

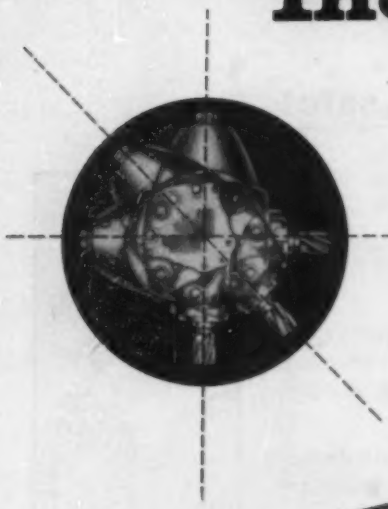
LAPOINTE

known to be the best in

BROACHING

All industry is talking about the new Van Norman

Increase Production Van Norman



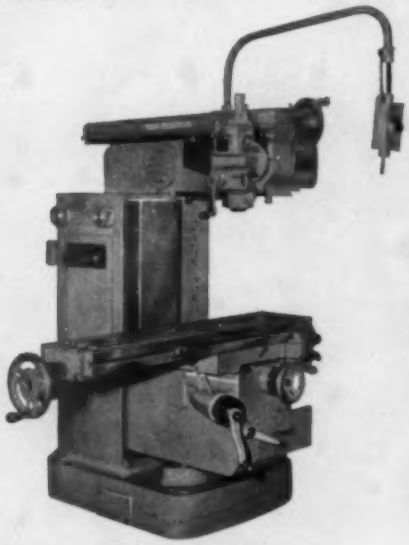
Horizontal, Angular or Vertical Milling are at your finger-tips with ONE Van Norman Ram-Type Miller. Versatility and Range Pay Off in Performance

A single investment in one Van Norman Ram-Type Milling Machine gives you the equivalent of two separate millers plus attachments at the much lower cost of a single machine. Not only do you save machine dollars, but with a Van Norman you get increased production with substantial savings in milling costs.

14 new standard models — cutterhead motors from 3 to 10 HP (*15 HP optional)—table sizes from 42½" x 10" to 64" x 14" (*72" x 16" optional). You thus have a wide range of selection to fit your needs most exactly. Write for individual catalogs giving complete information. Mail to: Van Norman Machine Company, Springfield 7, Massachusetts.

NO. 1R (22-3)—PLAIN OR UNIVERSAL

3 HP Cutterhead Motor; Size of Table, 42½" x 10"; Ram Travel 20½"; Power Longitudinal Feed 22"; Hand Cross Feed 10"; Vertical Hand Feed 24"; Pendant Control.
*Rapid Traverse Knee Elevating



NO. 1RQ (22-3)—PLAIN OR UNIVERSAL

3 HP Cutterhead Motor; Size of Table, 42½" x 10"; Ram Travel, 20½"; Power Longitudinal Feed 22"; Hand Cross Feed 10"; Vertical Hand Feed 24"; Pendant Control; 4" Quill Travel; 3 Power Feeds (.0015" - .003" and .006" Feed per revolution).
*Rapid Traverse Knee Elevating
*Optional Equipment

FOR YOUR CONVENIENCE..
NEW NUMBER DESIGNATIONS FOR VAN NORMAN MACHINES

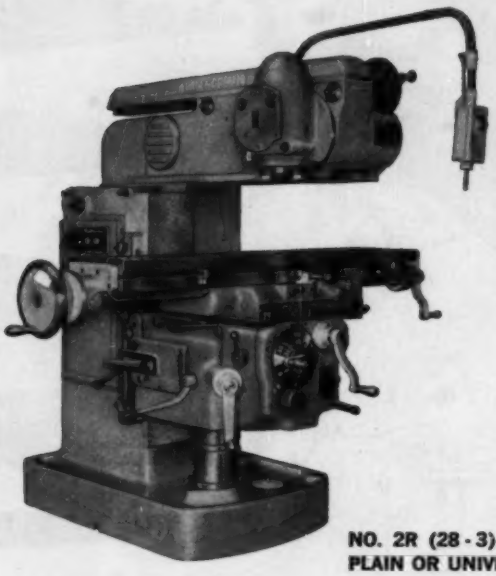
1	R	Q	22	3
Class	Ram Type	Quill Spindle	Table Travel	Spindle HP

VAN NORMAN MACHINE COMPANY

4121

SPRINGFIELD 7, MASSACHUSETTS • DIVISION OF VAN NORMAN INDUSTRIES, INC.

Efficiency with Ram-Type Millers

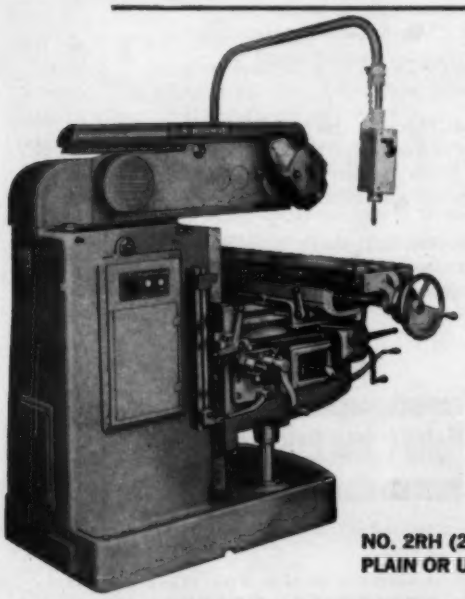


NO. 2R (28 - 3)—
PLAIN OR UNIVERSAL

3 HP Cutterhead Motor. Size of Table: 50" x 10½". Ram Travel: 29". Power Longitudinal Feed 28". Power Cross Feed 12". Power Vertical Feed 18". Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls.

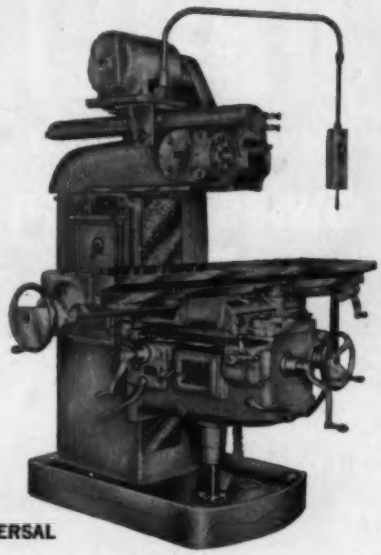
NO. 2R (28 - 5)—
PLAIN OR UNIVERSAL

5 HP Cutterhead Motor. Size of Table: 50" x 12". Ram Travel 25". Power Longitudinal Feed 28". Power Cross Feed 12". Power Vertical Feed 20". Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls.



NO. 2RH (28 - 7½)—
PLAIN OR UNIVERSAL

7½ HP Cutterhead Motor. Size of Table: 58" x 13". Ram Travel 29". Power Longitudinal Feed 28". Power Cross Feed 14". Power Vertical Feed 20". Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls.



NO. 38MA—
PLAIN OR UNIVERSAL

10 HP Cutterhead Motor. Size of Table: 64" x 14". Ram Travel 29". Power Longitudinal Feed 35". Power Cross Feed 14". Power Vertical Feed 21¼"; Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls Automatic Backlash Eliminator with Plain Saddle.

Heller

American-Swiss®

Swiss Pattern Files

INSIST ON THE BEST! Skilled craftsmen do. That's why you'll always find Heller Swiss Pattern Files wherever delicate or intricate parts require the perfect finishing touch. Their fine-cutting teeth are designed to stay sharp longer. So, they speed work and cut costs.

AMERICA'S BROADEST LINE! There's a size and shape for every corner, curve and cavity in the book. This preferred line of precision instruments also includes needle files and rifflers in handy sets.

CALL YOUR HELLER DISTRIBUTOR! He'll gladly tailor his inventory to match your needs for prompt delivery on short notice. Why not make a date with him soon?

Heller for Heller

HELLER TOOL CO.
Our 125th year 1836-1961

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

Branch Offices and Warehouses: Union, N. J. • Detroit • Chicago • Shreveport • Los Angeles • San Francisco • Portland, Oregon

Would you take a parrot's word for it?

Why take anybody's word for it?

Static and dynamic balancing of rotating parts is a critical quality control process. The elimination of destructive vibration is "life insurance" for your product. It is worth doing *correctly*.

Test before you buy! When you buy a balancing machine, you'll want to outline your requirements specifically—and insist on comparative tests. Only then can you *know* what you're buying. No reliable supplier of balancing machines will refuse to cooperate in these tests!

Gisholt shows you. Gisholt invites you to see your work balanced on a Gisholt Balancer and to observe a series of scientific balancing tests—to prove that your tolerances and production requirements will be met, *before* you buy!

Gisholt 6U Balancer handles variety of rotors from 350 to 10,000 lbs. This 5600 lb., double-inlet wheel and shaft assembly is rotated at 150 r.p.m. and balanced within .0003" bearing displacement. Despite heavy workpieces and massive machine, no special foundation is required for accurate operation.

FREE BOOKLET—Because there are vast differences in balancing equipment, it is important to know how the basic methods of measuring unbalance compare (mechanical, optical and electrical). The Gisholt Balancing Catalog explains these methods in detail—so that you can easily draw your own conclusions.

Ask your Gisholt Representative for this booklet or write for your free copy.

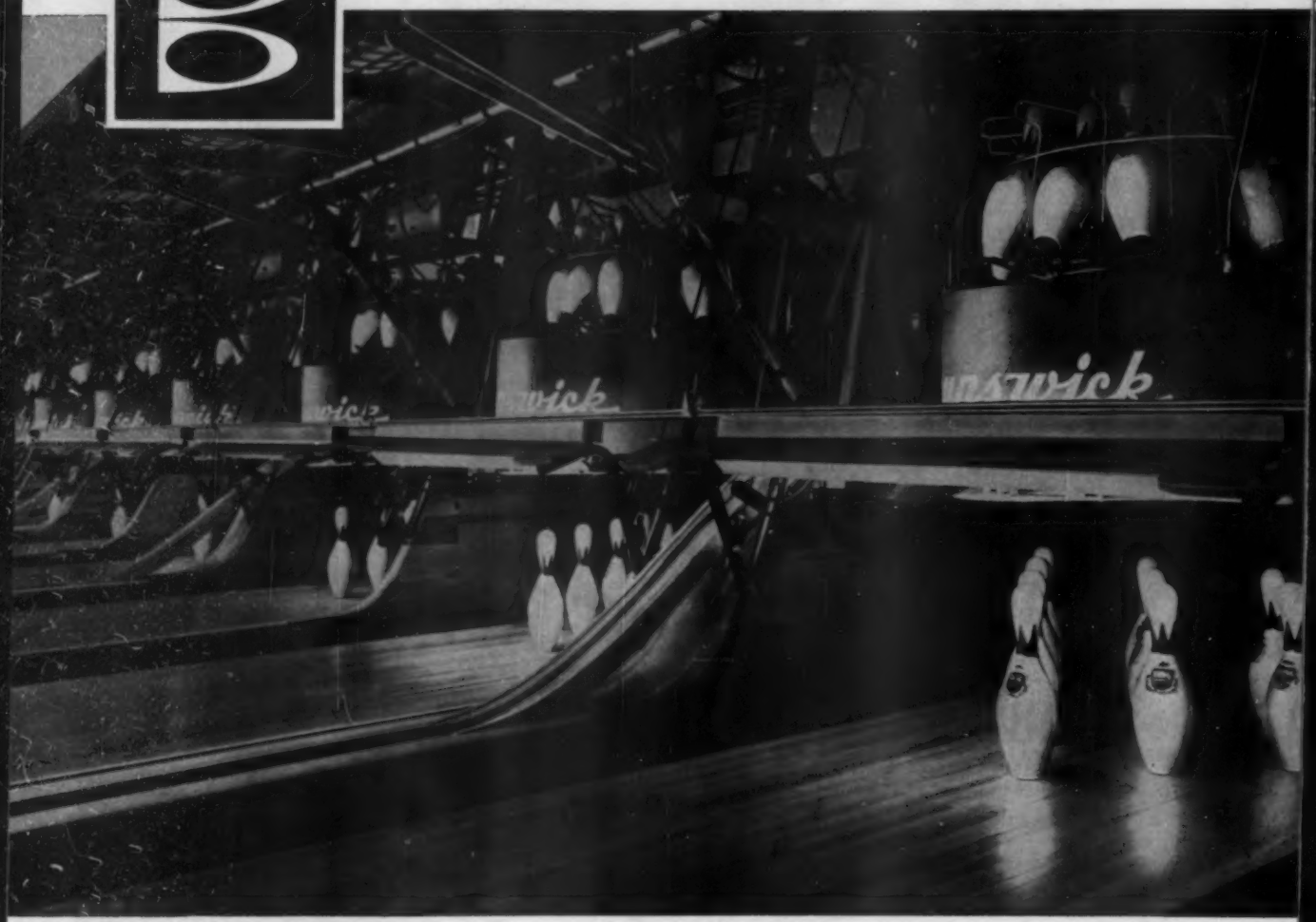
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines
• *Factory-Rebuilt Machines with New-Machine Guarantee*

Brunswick CORPORATION

puts "Mechanical Brain" to work



NYLOK NUTS GRAB HOLD...LOCK TIGHT! Vibration and heavy loads can't shake them loose. Put tons of load in a dump body, hoist it up, slam it down. Drive the truck over rough, jarring terrain. NYLOK Nuts hold tight—grip with a positive lock to anchor Heil Dump Bodies to the chassis as one solid unit. NYLOK Nuts stay tight in any position, seated or not. Easy to apply manually or automatically. Check your products for applications where NYLOK Nuts can do the job better, save money. Call your Republic Distributor or mail the coupon for more data.

REPUBLIC HIGH STRENGTH STEELS eliminate excess weight. Republic High Strength Steels in mobile equipment can result in weight savings up to 50%, with no sacrifice in safety or performance. High Strength Steels are produced by Republic in four types—"M," "50," "65," and "70"—with minimum yield strengths ranging from 50,000 psi to 70,000 psi; and minimum tensile strengths from 75,000 psi to 90,000 psi. Available in bars, plates, sheets, and strip. Send for data.

CIRCLE 177 READER SERVICE CARD

with ELECTRUNITE Mechanical Tubing

Better bowling by Brunswick. Better automatic pinsetting with ELECTRUNITE. That's the story behind today's most popular participation sport—bowling for the entire family.

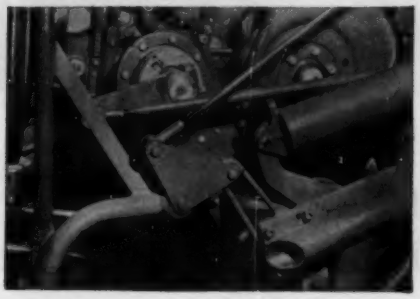
The Automatic Pinsetter, designed and produced by the Brunswick Corporation, Bowling Division, Chicago, Illinois, is a precision engineered, rugged, mechanical unit designed to set pins, sweep away "deadwood" and reset remaining pins, all in the matter of seconds, automatically.

Republic ELECTRUNITE Mechanical Tubing was specified because it met the extreme tolerance requirements with a substantial savings in weight. No sacrifice in strength. High quality ELECTRUNITE is delivered ready for fabricating. Excess manufacturing costs squeezed out.

Republic, world's largest producer of specialty welded tubing, offers ELECTRUNITE in a wide range of sizes, gages, and wall thicknesses, supported by technical and metallurgical assistance. Prompt price and delivery quotations usually within twenty-four hours. Call your Republic representative. Or, write direct. Use coupon below.

In just 12 seconds, the Brunswick "Magic Brain" sets up the alley for the next shot. The ball takes an elevator ride on ELECTRUNITE Mechanical Tubing to start the return trip to the bowler.

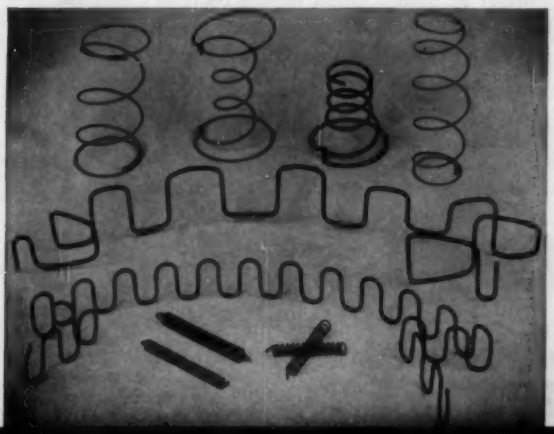
When the ball hits the hinged pit cushion the motion is mechanically transferred to trigger the machine cycle. ELECTRUNITE Mechanical Tubing is used for the pit cushion support arms construction.



ELECTRUNITE Tubing in three key locations assures smooth, trouble-free lifting, sweeping, Automatic Pinsetter operation. ELECTRUNITE is delivered ready for fabricating, saving production time and costs.

ELECTRUNITE was specified by Brunswick because it meets the extreme tolerance requirements, eliminating the need for any additional machining operations.

REPUBLIC STEEL WIRE has the strength, ductility, and toughness for difficult forming operations. Types for virtually any application: Manufacturer's Coarse Wires, Spring Wires, (Standard High Carbon and MB High Carbon), Screw, Rivet, and Heading Wires. Republic metallurgists are ready to help you in the selection, application, and processing of wire to best meet your requirements. Write for details.



REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL — Strong, Modern, Dependable — Steel

REPUBLIC STEEL CORPORATION
DEPT. AM-1600-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following products:

- ☐ ELECTRUNITE® Mechanical Tubing
- ☐ NYLOK® Fasteners
- ☐ Republic Steel Wire
- ☐ Republic High Strength Steels

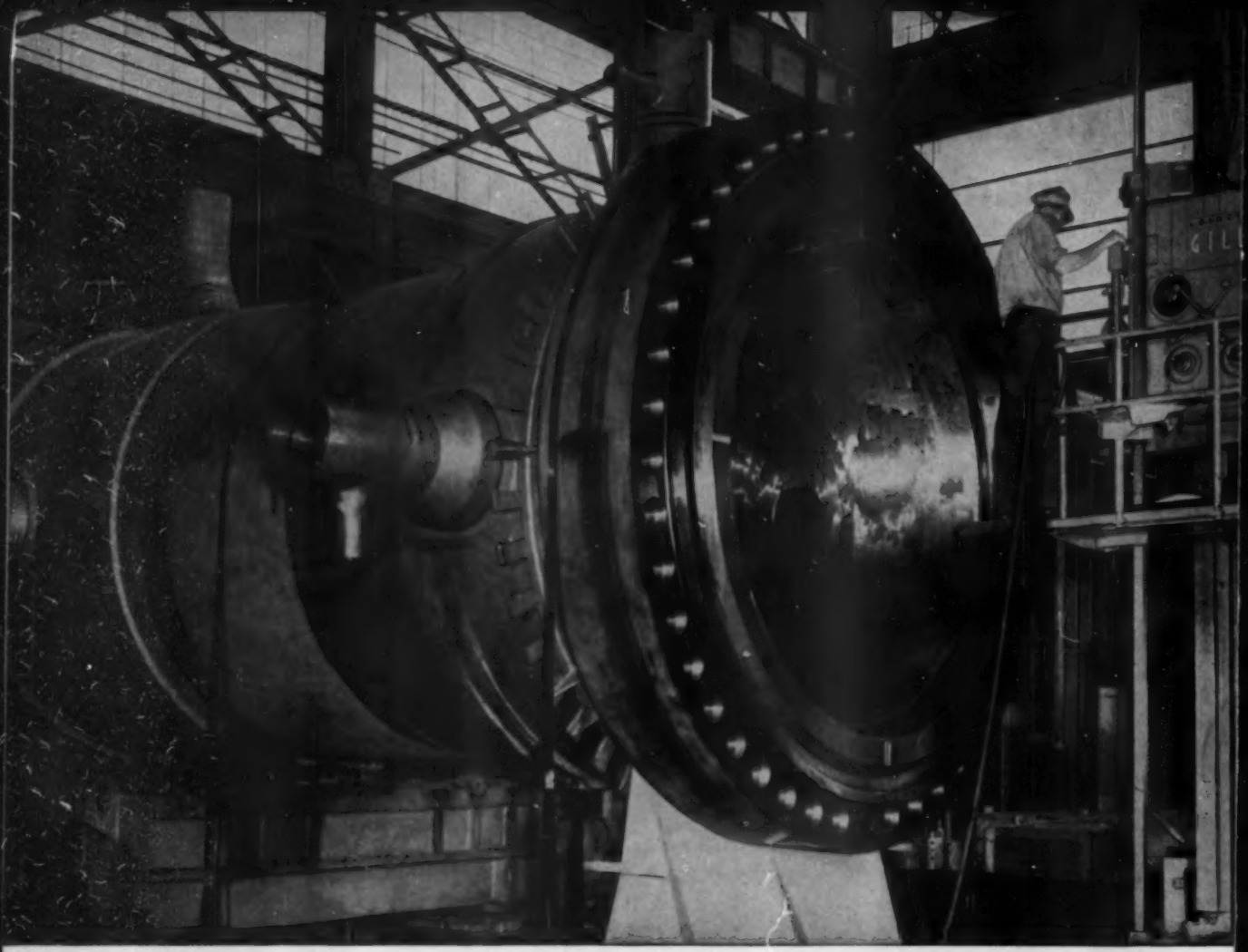
Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

CIRCLE 178 READER SERVICE CARD



Courtesy Combustion Engineering, Inc.

Combustion Engineering specified more than "ordinary boring mills"

Combustion Engineering, Inc., pioneer manufacturer of heavy reactor vessels, concluded that ordinary boring mills would not produce the close tolerances and surface finish required in their critical operations. That is why they specified a Cincinnati Gilbert floor type boring mill for this job.

The workpiece is a 96-ton stainless steel reactor for a Naval nuclear power plant. The Gilbert machine is used to finish the boring of the bolt holes in the 20" thick flange, and to machine the outlet nozzles.

Combustion Engineering's high standards require a surface finish of 32 R.M.S. on some of the bolt holes—an easy specification for a Gilbert, which can bore holes with a mirror finish, when required. A Tele-Vernier optical measuring system increases the speed and accuracy of machine positioning.

Work of equally high quality is produced on a number of other Gilbert boring mills at Combustion Engineering's Chattanooga and Windsor plants—proof that "those who buy Gilbert buy Gilbert again."

Write for new Bulletin 558.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio.

Ask for free catalog 558

GILBERT

CIRCLE 179 READER SERVICE CARD

NEW

CAGEROL®

CAGE TYPE
HEAVY DUTY
NEEDLE ROLLER
BEARING

BY McGILL®

INCREASE EXPECTED LIFE UP TO 10 TIMES!

You need CAGEROL bearing performance if higher speeds and increased misalignment have prevented the utilization of needle bearing load capacity in your applications. Most important, CAGEROL bearings can deliver up to 10 times more expected life where misalignment and increased speeds exceed the capabilities of ordinary and guided needle bearings. The difference is in the exclusive McGill construction that features tapered retainer pockets for balanced roller guidance, crowned rollers, and black oxide retainer finish. CAGEROL bearings are interchangeable with all heavy duty needle roller bearings — with or without inners in two bore sizes.

McGILL MANUFACTURING CO., INC., Bearing Division
300 N. Lafayette Street, Valparaiso, Indiana

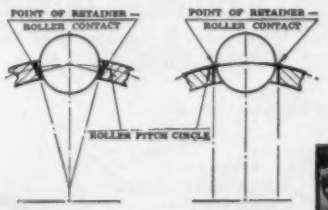
1 Exclusive crowned roller construction, electronically gauged to insure precision contour and size uniformity. Relieved ends assure even load distribution.

2 Flat ends fully engage integral race shoulders, provide maximum support.

3 Proper guidance assured by tapered retainer pockets. The design insures *balanced* roller support and eliminates corner wear from edge loading of straight pockets where retainer OD and pitch circle are coincident.

4 Simultaneously punched pockets assure accuracy of race and roller alignment. The black ferrous oxide retainer finish absorbs and retains lubrication, reducing the friction coefficient.

5 SAE 52100 steel outer race has optimum hardness and surface finish.



Ask for Bearing Catalog #52-A.

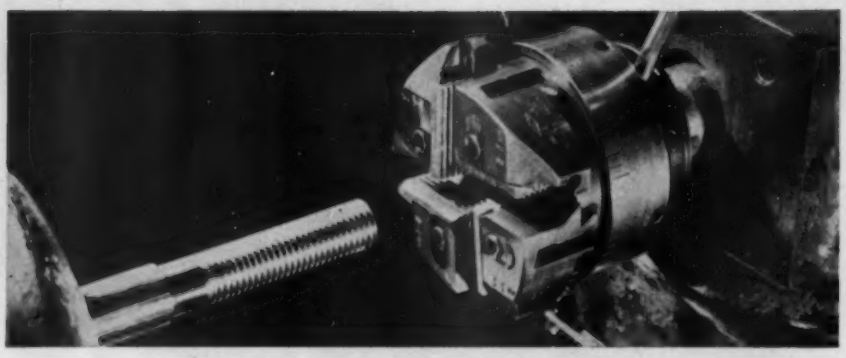
engineered electrical products

McGILL®

precision needle roller bearings

New Free-Machining Armco Stainless Steel Can Help You Cut Costs

For Durability, Strength, Economy



Another new grade of Armco Stainless—Armco 14 SF—offers you improved machinability that can cut production costs. A modification of Type 416, it provides a unique combination of free-machining characteristics and surface finish for this class of stainless steel.

Armco 14 SF Stainless Steel—

- —produces short free-breaking chips that don't clog machine or cutting tools.
- —gives materially increased tool life at Type 416 cutting speeds, or can be machined at increased speeds with no loss in tool life.
- —yields parts with excellent surface finish.

Try new Armco 14 SF Stainless Steel on jobs where you are now using regular Type 416 and see the difference for yourself. The only exceptions are parts that need the higher strength and hardness of heat treated Type 416.

Contact us or your Distributor of Armco Stainless Steel bar and wire today for complete information on this new free-machining stainless steel. Armco Steel Corporation, 1231 Curtis Street, Middletown, Ohio.

ARMCO **Armco Division**

New steels are born at Armco

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Esco, Ltd. (AB)

A "live" demonstration from Brown & Sharpe . . .

"Let me show you how Brown & prevents mixups in steel

. . . Mr. James R. Scott, Metallurgist, Heat

"Brown & Sharpe puts this smooth blue finish on its Ready Mark® flat stock to solve three problems tool and die makers and heat treaters have had for years . . .

FIRST: *To prevent mistakes in the type of steel* picked up for a job. The blue color gives permanent identification, no matter how small the piece.

SECOND: *To protect the steel indefinitely from rust.*

THIRD: *To save layout time by giving you a pre-colored surface,* all ready for scribing.

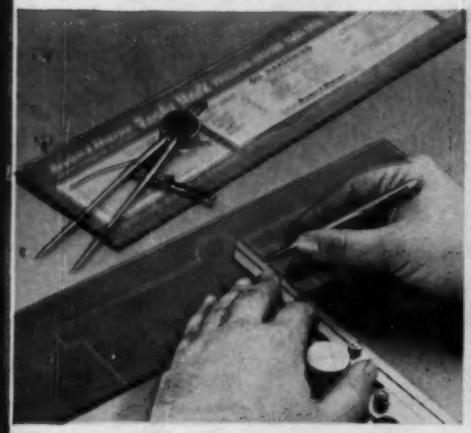
"Saves thousands of dollars a year in cracked dies and other spoiled work that a mixup in steel and hardening can cause! You can't mistake this A.I.S.I. Type 01 Oil Hardening Tool Steel for any other. It's always *blue.*

"And look at the automatic rust protection. Ready Mark's .0002"-thick 'Endurion' finish has better corrosion resistance for its thickness than any other known commercial finish. It can lie around for years, in good condition.

CIRCLE 183 READER SERVICE CARD

Sharpe's Ready Mark Flat Stock and saves layout time'"

Treating Dept., Brown & Sharpe Mfg. Co.



"Better yet — it saves you layout time. There's no grease to take off — no marking fluid to put on — no drying to wait for. Ready Mark Blue is all ready for layout when you get it. You just start scribing!

"Notice the color won't rub off or flake off the way marking fluids will. It won't even wash off in water, oils, coolants, or other agents used in shops. Your layout lines stay sharp and clear, through tough handling and machining.

"Color burns off during heat treatment, without affecting the treatment—leaves the piece at finish tolerances. This color deposit doesn't penetrate the steel or tend to etch the surface — so it doesn't have to be ground off later.

"Under the color, you get the country's best free-machining, non-deforming A.I.S.I. Type 01 Oil Hardening Tool Steel. Every lot is quality tested to be sure that it meets rigid Brown & Sharpe specifications.

"We grind it to precise sizes for you — every one free from decarb and machining stresses. They're colored . . . individually packaged . . . with complete description and heat treating instructions on each package.

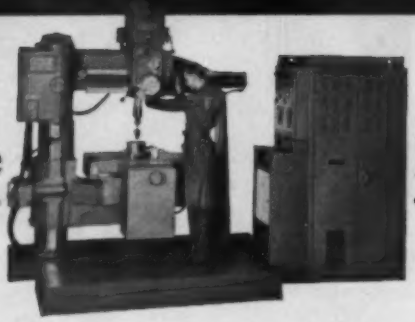
"You don't have to settle for anything less than Ready Mark. It doesn't cost a cent extra! And by switching to Ready Mark, you make steel handling easier for everybody from the tool crib to the heat treating department."

Get it, fast, from your Brown & Sharpe distributor. Brown & Sharpe Mfg. Co., Providence 1, R. I.

Also available from Brown & Sharpe: Bright finished flat stock in same analysis and sizes as above • Ready Mark Air-Hardening Die Steel, colored maroon. (A.I.S.I. Type A2—has exceptional dimensional stability) • Bright finished low-carbon "Thrift" Stock • Special sizes in all types at reasonable cost.

Brown & Sharpe PRECISION CENTER

CIRCLE 184 READER SERVICE CARD

The Indispensable  Drilling Machine

In every shop there is one machine tool you "can't get along without". This new Numerically Controlled Layout Drill is that kind of machine tool.

It's simple, easy to operate.

Fast, 3 seconds average, hole-to-hole. Accurate, ± .002″ on location. Handles big work (24″ x 42″ table). General Electric Mark II numerical control system with full zero offset.

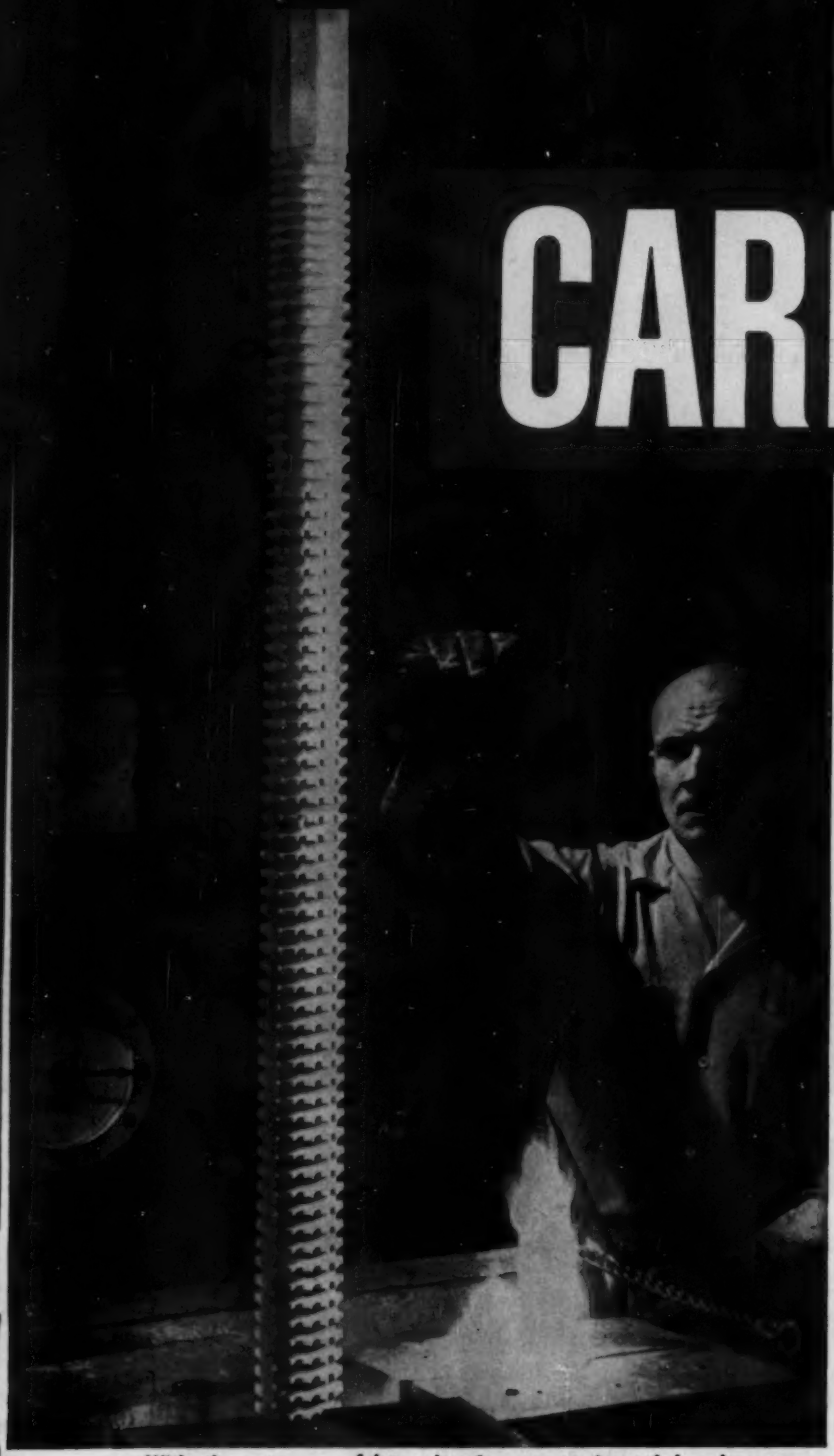
It's your best buy in numerically controlled drills. We say it's indispensable. In our own shop this Fosdick N/C Layout Drill eliminated the need for 250 fixtures in one ten-week period. In that short time it more than justified its cost. It can do the same for you.

Get a proposal from Fosdick.

FOSDICK

The Fosdick Machine Tool Company
Cincinnati 23, Ohio

CAREFUL!



With the sure, *careful* touch of an experienced hand, veteran CTW heat-treat man hoists 72" broach from a vertical furnace.

Care in the creation of Continental Broaches takes precision manufacturing a step beyond the exactness of quality control. Thirty years of broachmaking—designing and producing thousands of standard and custom-made broaches—assures *unmatched* efficiency and performance from CTW Broaches.

Find out how Continental's experience in broach engineering, modern heat treat methods and cost-saving production processes can cut downtime and increase output in your operation. Call your local Ex-Cell-O representative, or contact Ex-Cell-O Detroit; in Canada, Colonial Tool Co., Ltd., Windsor.

59-14

CTW Continental TOOL WORKS

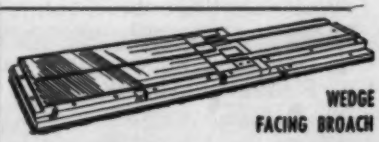
DIVISION OF

EX-CELL-O CORPORATION

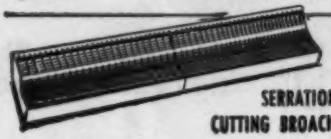
DETROIT 32, MICHIGAN

PINETREE FORM BROACH

SPIRAL SPLINE BROACH



WEDGE FACING BROACH



SERRATION CUTTING BROACH

INVOLUTE SPLINE SHELL-TYPE BROACH

CARBIDE-TIPPED BROACH SECTIONS

CIRCLE 186 READER SERVICE CARD

UNBREAKABLE!

This is a punishing test for a hack saw blade. We do it to prove that a Marvel High-Speed-Edge Hack Saw Blade is unbreakable. A Marvel Blade can be bent like this thousands of times and it still won't break.

Why? Because the blade body—to which a high speed steel cutting edge is welded—is made of a tough, non-brittle alloy steel designed to take the heaviest feed pressures and highest speeds any modern hack sawing machine can develop.

What does this unbreakable feature of Marvel Blades mean to you?

1. Operators, knowing they can trust Marvel Blades not to break, tension them truly taut (from 200% to 300% more than ordinary blades) to produce maximum obtainable accuracy of saw cut.
2. They can safely apply heavier feed pressures and higher speeds without endangering themselves or the machine to produce faster cutting-off.
3. Longer cutting life is assured because the blade simply won't break.

Ask for Marvel High-Speed-Edge Hack Saw Blades by name and you can be sure you're getting the unbreakable blades designed to give you maximum accuracy, speed, and safety in your cutting-off operations. Leading Industrial Distributors have Marvel Blades in stock.

MARVEL *Metal Cutting* **SAWS**

BETTER MACHINES
BETTER BLADES

ARMSTRONG-BLUM MANUFACTURING CO. • 5700 Bloomingdale Avenue • Chicago 39, Illinois

B-1178

CIRCLE 167 READER SERVICE CARD

New NUMERA-TROL (XLO) Automatically Selects Bore Size and Location!

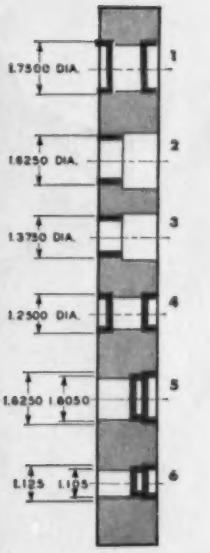
Only Ex-Cell-O's Model 758 Numera-Trol Machine combines a breakthrough in tape-control application with a unique concept in machine design to give you these exclusive production capabilities:

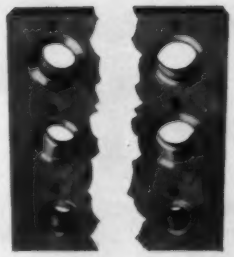
- Automatic pre-selected bore diameter control during machine cycle
- Automatic work positioning for infinite center locations
- Automatic straight-boring, step-boring and counterboring from either end of machine

Using interchangeable boring bars which respond to tape control through a new mechanism developed by Ex-Cell-O, the Model 758 Numera-Trol lets you program variable bore diameters. (Tools are available giving an infinite range of diameters in one-inch increments.) Bore diameters are controllable within .0005", bore depth is controllable to plus or minus .0005".

Infinite bore locations, accurate within .0002" of true center, are possible within the Model 758's 10-inch cross slide and vertical slide strokes.

Infinite, too, are the Model 758's applications. Your Ex-Cell-O Representative can give you complete details, or write direct for Bulletin 506015.





On this workpiece, tape-controlled sequence is programmed from largest to smallest diameters; automatic boring bar adjustment is made at the end of each stroke to eliminate drawback lines. Model 758 holds concentricity within very close tolerances.

60-84

EX-CELL-O FOR PRECISION

PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

ARMSTRONG

TOOL HOLDERS

A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs. Write for literature.

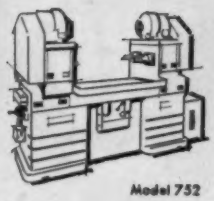
If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. CHICAGO 46, ILL.

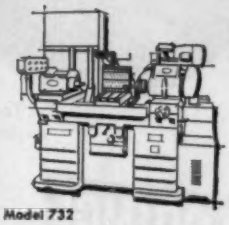
EX-CELL-O ANNOUNCES...

NEW Horizontal Boring Machines

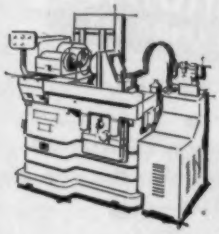
Model 751



Model 752



Model 732



Model 731

Designed and built for maximum dimensional stability under all operating conditions, these new hydraulically operated precision boring machines offer the ultimate in accurate repeatability.

Check these features for production efficiency . . .

- **Temperature controlled hydraulic panels**
- Extreme rigidity and stability in bases and tables
- Hydraulic and coolant system externally mounted
- Ex-Cell-O standard and tapered roller bearing spindles
- Designed for close-tolerance precision boring, turning, facing, counterboring, chamfering, grooving, recessing and trepanning operations.
- May be operated either manually or automatically.
- Engineered for simple installation into automated production lines.

Contact your Ex-Cell-O Representative or write direct for details.

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EX-CELL-O FOR PRECISION

PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

Machinery Division

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

HARDINGE
ELMIRA, N.Y.

HARDINGE Sjogren Chucks

Quality at Low Cost

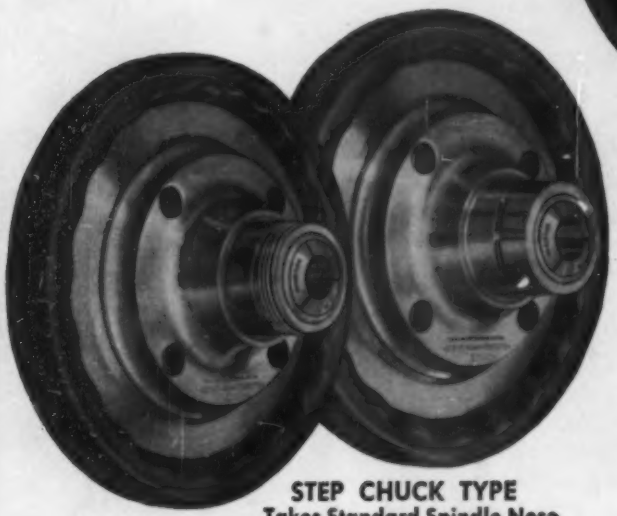
HARDINGE-SJOGREN Speed Collet Chucks for tool room lathes, engine lathes and grinders.

Available for Threaded Nose, Cam Lock, Taper Key Drive and American Standard Spindles.

REGULAR TYPE

AVAILABLE IN FIVE COLLET CAPACITY SIZES

1 1/16", 1 3/8", 1 3/4", 2 1/4", 3 1/2"



STEP CHUCK TYPE
Takes Standard Spindle Nose Accessories As Used With Hardinge Precision Machines

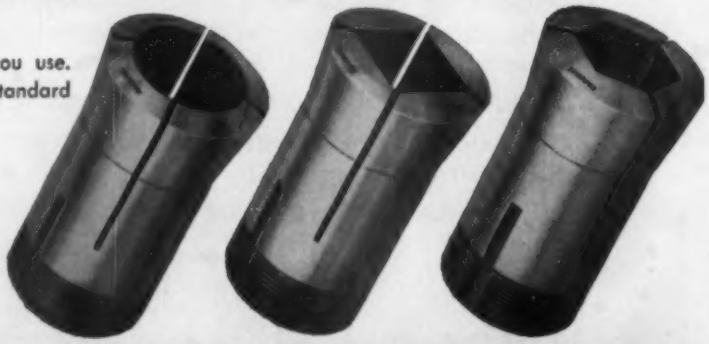
LEVER TYPE

Ask Your Hardinge Representative or Local Distributor For Bulletin 88

HARDINGE
ELMIRA, N.Y.

HARDINGE Low Cost Steel Collets

Maximum efficiency — Pay for only what you use. Records show that 82% of all sizes used are standard 16th sizes.



HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

Using basic components, seven different arrangements are possible, as shown above. Spindle drive motors can be mounted at right, left, or on both sides with single or double spindles; two machines can be placed side-by-side or used with other production machines.

The 4 BIG Features of Ex-Cell-O's New 411 Vertical Are Important To You

1. QUICK TOOL CHANGING—Tool changing and adjusting is fast and easy because of "clean" design and placement of the Model 411's components.

2. EASY PARTS HANDLING—Vertical construction lends itself to safe, easy loading and unloading of parts in a wide variety of shapes and sizes.

3. SINGLE COLUMN CONSTRUCTION—Solid base-column gives firm support to the hydraulically-operated compound tool slide. Rugged, simple construction assures maximum accuracy and efficiency, plus long life with lowest maintenance.

4. PRODUCTION VERSATILITY-The all-new Model 411 performs turning, boring, facing, grooving, limited contouring and chamfering operations singly or in combination. Often, both sides of disc-type parts can be machined simultaneously.

Contact your Ex-Cell-O Representative or write direct for details.

60-68

EX-CELL-O FOR PRECISION

PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • COMPUTER PRODUCTS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • DAIRY AND OTHER PACKAGING EQUIPMENT

Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

It's WHAT YOU DON'T SEE that counts!

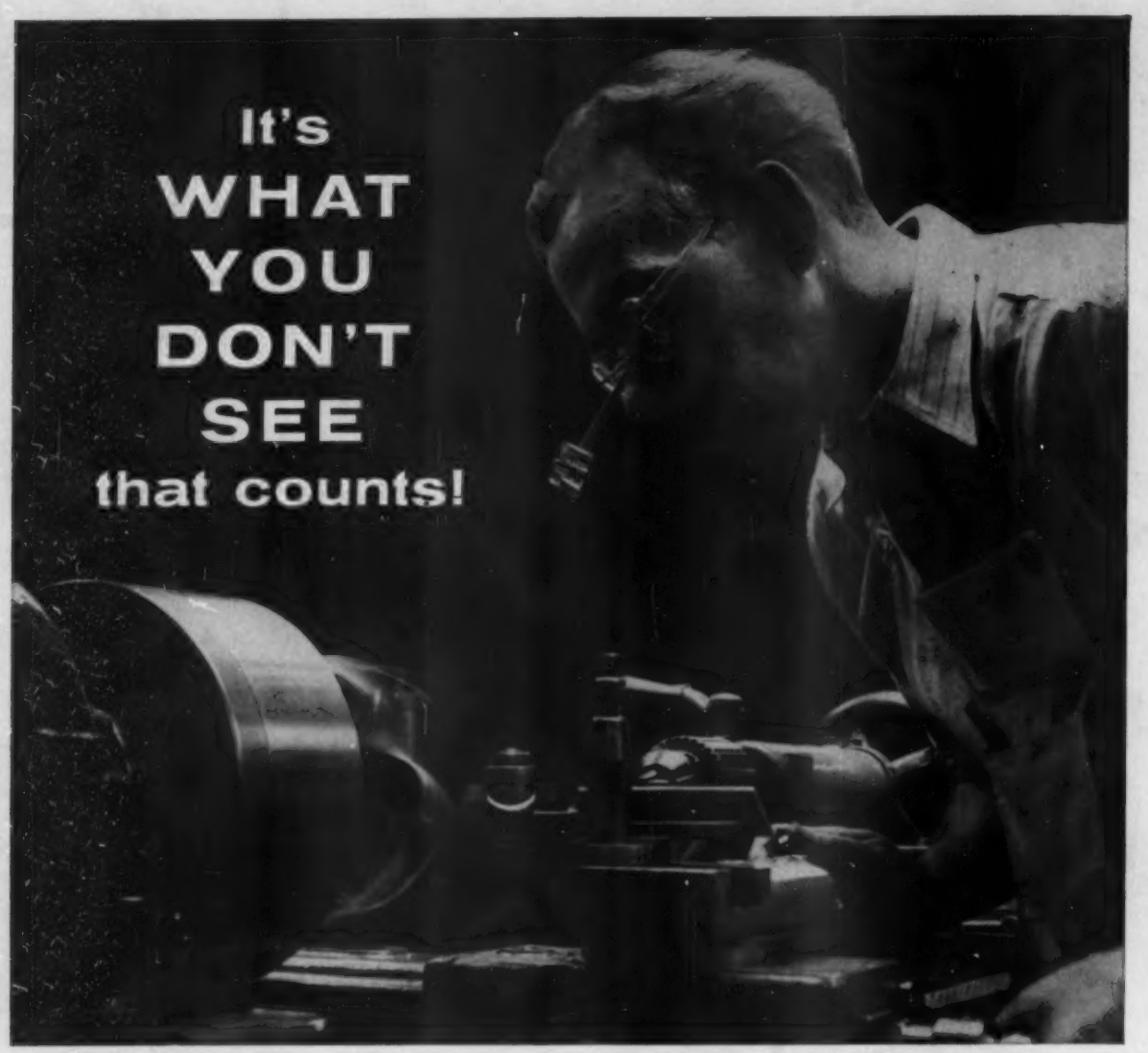


Photo from LEARCAL DIVISION, LEAR INC., Los Angeles

Quality control and production records can quickly prove the efficiency of South Bend 16" Lathes. What you can't see is their *dependability* that assures low cost precision machining for years to come. They can do it because of such features as—

- Integrity of manufacture—honest workmanship using the finest materials.
- Spindle bearings designed specifically for precision work—microfinished sleeve type for close tolerance, *fine finish* work.
- Built to take it for *proven* low maintenance.
- Trouble-free belt drive to the spindle—quiet, no vibration, no gear marks.
- *Write for catalog of South Bend Lathes, milling machines, shapers, drill presses and pedestal grinders.*

Specifications	16" Lathes
Collet capacity	1 1/8"
Spindle speeds	15 to 980 r.p.m.
Cross and longitudinal feeds	48
Threading feeds	48
Base price	$2591

Up to 36 months to pay

SOUTH BEND LATHE

South Bend 22, Indiana

Building Better Tools Since 1906

Cost-Cutting—

A SIMPLE MATTER OF SELECTION

59-15

COUNTERBORE SETS

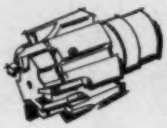
INVERTED SPOT FACERS

COUNTERBORES—

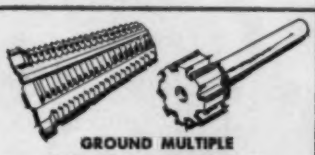
COUNTER SINKS, HOLDERS, PILOTS

FLOATING TAP DRIVERS

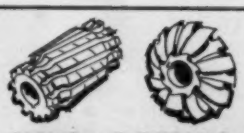
INSERTED BLADE FACE MILLS



MULTIPLE DIAMETER BORING CUTTERS



GROUND MULTIPLE THREAD MILLING CUTTERS



GROUND AND UNGROUND FORM-RELIEVED CUTTERS

SINGLE-POINT CARBIDE TIPPED TOOLS

MULTIPLE STEP BORE REAMERS

CARBIDE TIPPED CYLINDER BORING CUTTERS

DOVETAIL FORM TOOLS

CARBIDE TIPPED BROACH SECTIONS

INVOLUTE SPLINE SHELL TYPE BROACHES

CIRCLE 194 READER SERVICE CARD

Every standard and special tool is of but one quality—the finest available. Since 1921, Continental has specialized in cost-saving cutting tools (just a few of which are shown at left), producing design innovations in hardened, high-speed tool steel, carbide and special-alloy cutting materials.

Available in the types and sizes required to do the *complete* job from rough to finish, Continental Cutting Tools are job-tested in the toughest proving ground—Ex-Cell-O's own machine tool and precision parts production lines. As a result, they come to you ready to increase the output of even your best machines!

Continental engineers will be glad to work with you in selecting the correct CTW Cutting Tool for long life and maximum performance. See your local Ex-Cell-O Representative, or write direct to Continental Tool Works Division for full details. In Canada, contact your local Ex-Cell-O Sales Associates Representative or write direct to Colonial Tool Co., Ltd., Windsor.

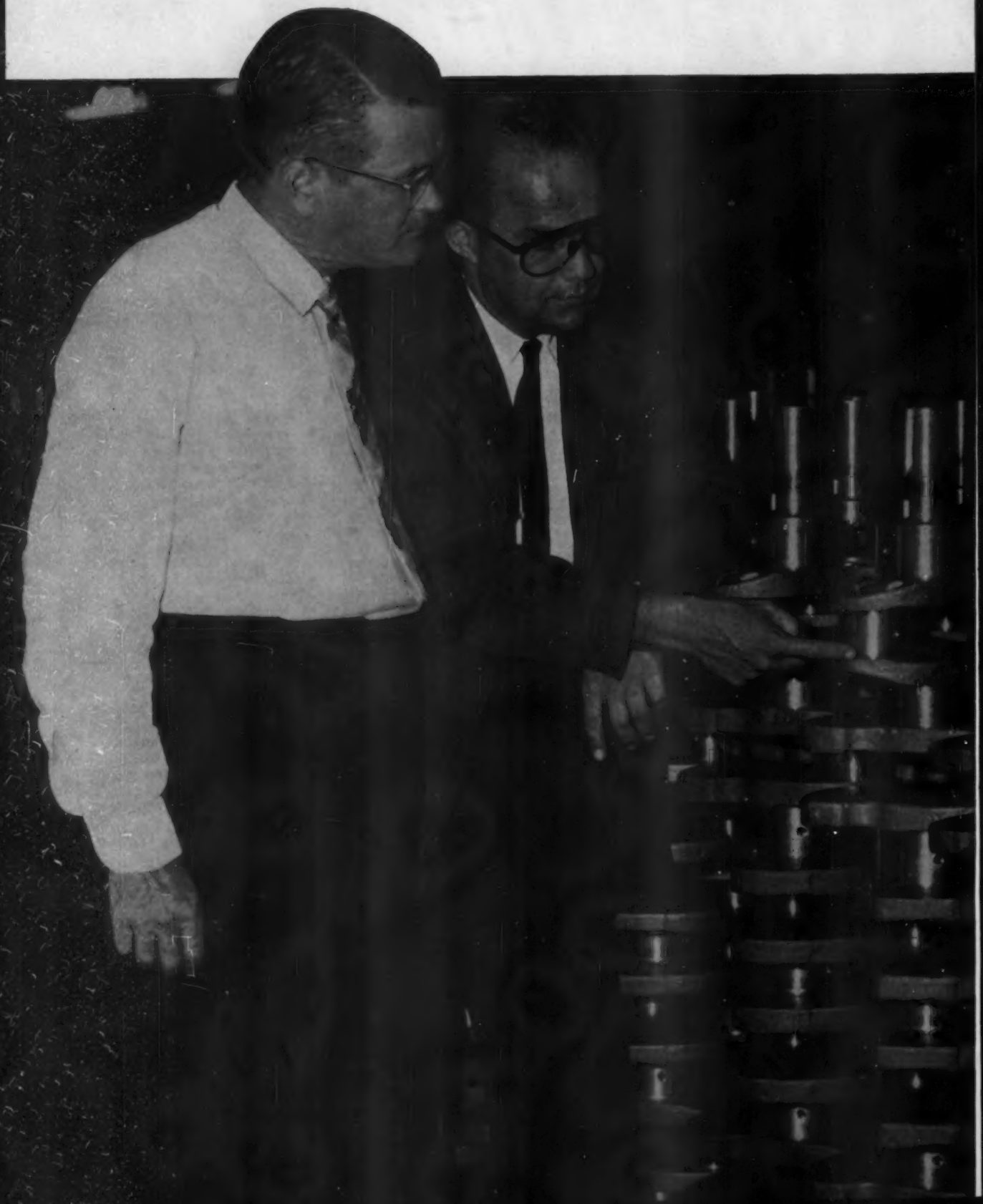
Continental **TOOL WORKS**

DIVISION OF

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

How Norm Nesbitt and Allen Moore



teamed up to cut dressing costs 50% at ATLAS CRANKSHAFT

This is a good example of the way it sometimes pays to break a habit even when it's a pretty *good* habit.

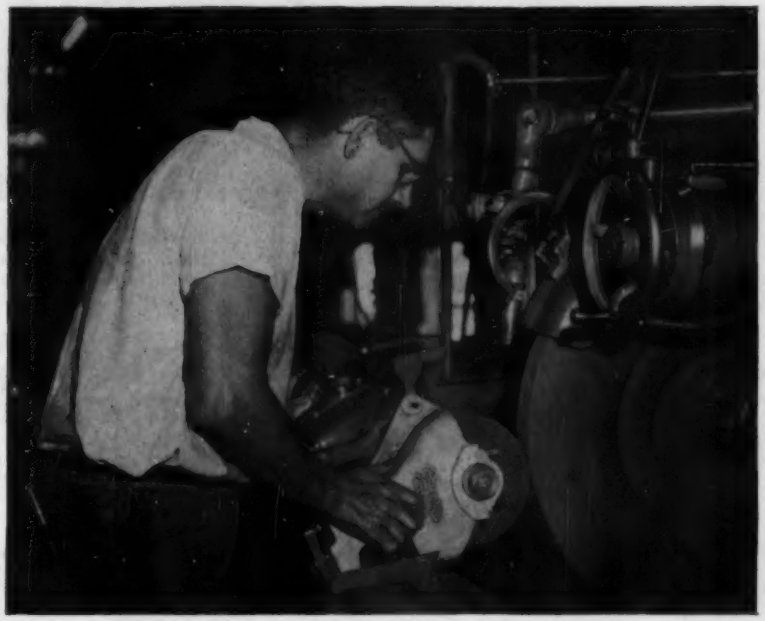
At Atlas Crankshaft Corp., in Fostoria, Ohio, the dressing wheels that are used to keep big crankshaft grinding wheels at peak performance play a very important part in maintaining production at a high and constant volume. There was nothing really wrong with the 6" dressing wheels Atlas had been using for years. They did a pretty good job and usually lasted through an 8-hour day.

But Atlas' Purchasing Agent Norm Nesbitt wasn't content with "good enough". He wanted "better" and had his eye firmly fixed on no less than "best". He got hold of Bay State representative Allen Moore and told him to go to work on the problem.

Moore is thoroughly accustomed to the kind of abrasive problems that require long and painstaking analysis. But this time, he found that it was a case of the solution being so simple that nobody had thought of it.

He simply recommended a larger dressing wheel . . . an 8-inch wheel instead of the 6-incher that was being used. Both wheels were stubbed at 4" but buying the larger wheel reduced the cost per cubic inch of usable abrasive 50% and cut the number of dressing-wheel changes from one a day to one every two days.

Not all abrasive problems are as easily solved as this one, of course. But the point of this case is both simple and important: The most obvious improvements in grinding operations are often the most difficult to spot. Your Bay State distributor and our direct representatives are thoroughly *trained* to spot the obvious and to *dig* for what is not obvious. You can't lose and you may well gain substantially by just turning them loose to analyze your grinding operations. *Better grinding at lower cost . . . that is their business.*



Atlas operator Paul Huff sets new 8" dressing wheel against surface of big, crankshaft grinding wheel. 8" diameter dressing wheel lasts twice as long as 6" wheel because both are stubbed at 4" and 8" wheel costs half as much per cubic inch of usable abrasive.

Norman Nesbitt, left, as purchasing executive for Atlas Crankshaft Corp. for 15 years, has encountered, and successfully met, every purchasing problem "in the book" . . . and then some!

Allen Moore, abrasive specialist, with many years experience with distributors and grinding wheel manufacturers, has a broad knowledge of abrasive wheel applications. His Business Administration degree attests to his awareness of cost-savings importance.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

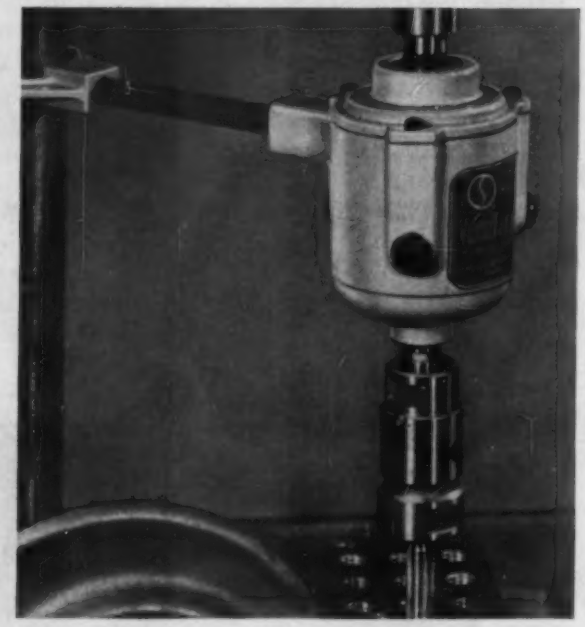
CIRCLE 196 READER SERVICE CARD

IT'S A FACT!

You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER

Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.

Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-½"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press . . . features 0 to ½" capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER...
operates easily in any material
...with widest capacity range
...yet costs far less

JUST $63 COMPLETE

The *new* VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to ½". It develops *more power*—makes the tapping of ½"-13 holes a simpler matter, even with light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of $63 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon. Also check number on the reply card in this magazine for literature.

Supreme
PRODUCTS CORPORATION
2222 S. CALUMET AVENUE • CHICAGO 16, ILLINOIS

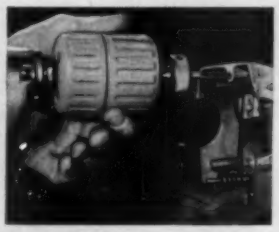
You get more from power tools with Top Quality Supreme Accessories

Supreme Brand Chucks

Noted for unmatched quality. The widest range of sizes and types...one for every machine in your shop. Exclusive Supreme hardening means greater accuracy—longer wear.

Supreme Versamatic

Reversible speed reducer for portable drills. Fits all makes—permits their use for power screw driving, nut running and heavy duty drilling. 7 to 1 reduction means high torque increase. *A fine tool.*



Supreme Push-Pull Tapper

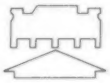
Like the Versamatic, but made for the single purpose of tapping with portable drills. Reverses instantly for tap removal. Handles taps up to 5/16" diameter. Top quality. Simple to operate.

SUPREME PRODUCTS ARE IN STOCK IN YOUR CITY. CALL YOUR DISTRIBUTOR

PRECISION ASR PRODUCTS

390

When you think of PRECISION

For life time precision Lucas provides airlift to saddle and table. 

These elements are supported on a thin film of lubricated compressed air during traverse. This separation of metal from metal virtually eliminates wear. During machining cycles the saddle and table are automatically clamped down tight to provide absolute rigidity for even the heaviest cuts. Unclamping is automatic, too. These are two aspects of Lucas design which contribute to the precision of these machines. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of Precision . . .

think of . . .

LUCAS
PRECISION

When you think of RELIABILITY

Lucas automatic power positioning

automatically repeats

automatically repeats

automatically repeats

to ±.0001 . . .

A simple, completely reliable system of dial indicators, end measures, and electrical controls automatically disengages rapid traverse, engages the fixed, constant-rate power feed and precision stops the unit at predetermined settings. Automatic power positioning assures the highest order of repetitive accuracy with an absolute minimum of operator attention.

A new catalog describes our complete line of horizontal boring, drilling and milling machines. Write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of Reliability . . .

think of . . .

REMEMBER?

Remember when a machine tool purchase was so simple that a company owner and his assistant would merely get together to decide if a new tool would be handy?

Today, justification of such purchases demands detailed study and frequently the use of accounting machines or computers. Then, with proof in hand, management is ready to decide with confidence.

WIEDEMANN TURRET PUNCH PRESSES — the only engineered short run method of accurately positioning holes, notches and other openings in sheet metal or plates — have proved their exceptionally quick pay-off value. Reductions of 60% to 90% over old methods are commonplace. One company which makes computers paid for its Wiedemann with savings from a single job of three months duration.

Let Wiedemann show the profits you may realize. Just send drawings of your components which are pierced. We will completely analyze them and determine actual production time. Write today for a copy of "Behind the Scene Savings" — outlining 16 major phases of plant operation in which savings can be made.

From the versatile 150 ton R-15 down to the hand operated R-2, there's a Wiedemann for your short run piercing requirements.

WIEDEMANN

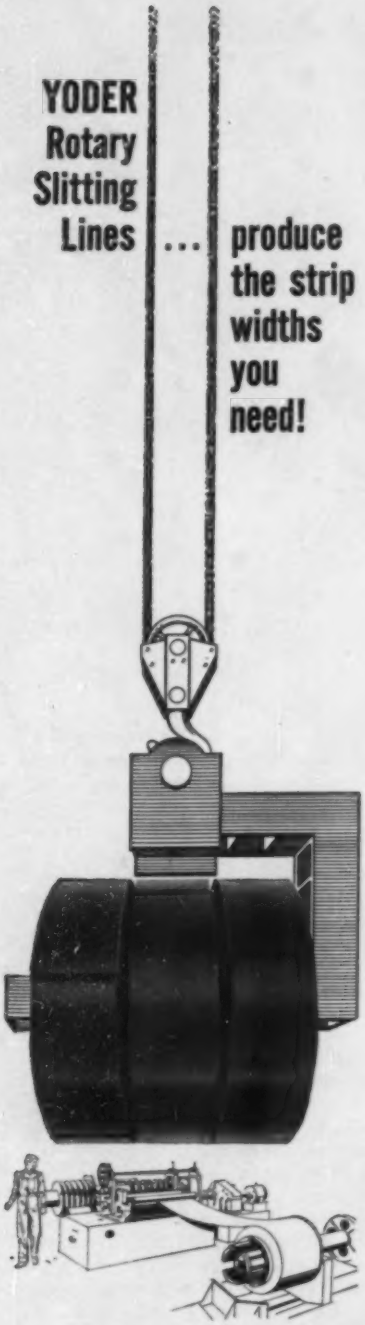
WIEDEMANN MACHINE COMPANY

Gulph Road • King of Prussia, Pa.

◀ CIRCLE 199 READER SERVICE CARD

CIRCLE 200 READER SERVICE CARD

YODER Rotary Slitting Lines ... produce the strip widths you need!



Investigate the many advantages of YODER-engineered Slitter Installations. Write today for the comprehensive, 80 page YODER Slitter Manual ... it's yours for the asking!

THE YODER COMPANY
5519 Walworth Avenue • Cleveland, Ohio

1910 FIFTY YEARS 1960

YODER ROTARY SLITTING LINES

LETTER from the PUBLISHER

Labor Content ... Down

In his editorial "Why the Squeeze?" in our January 9, 1961 issue, Editor Burnham Finney calls for action by Congress to repair the damage done by the overzealous Labor Department in its administration of the outdated Walsh-Healey Act on minimum wages. While the machine tool industry, to which the provisions of the act are about to be applied, symbolizes Small Business, this continuing action by the Labor Department has implications for *all* businesses . . . large or small. The major import of Walsh-Healey is not just that it raises the floor under wages but that it tends to force an adjustment *upward* in every wage classification *above* the minimum.

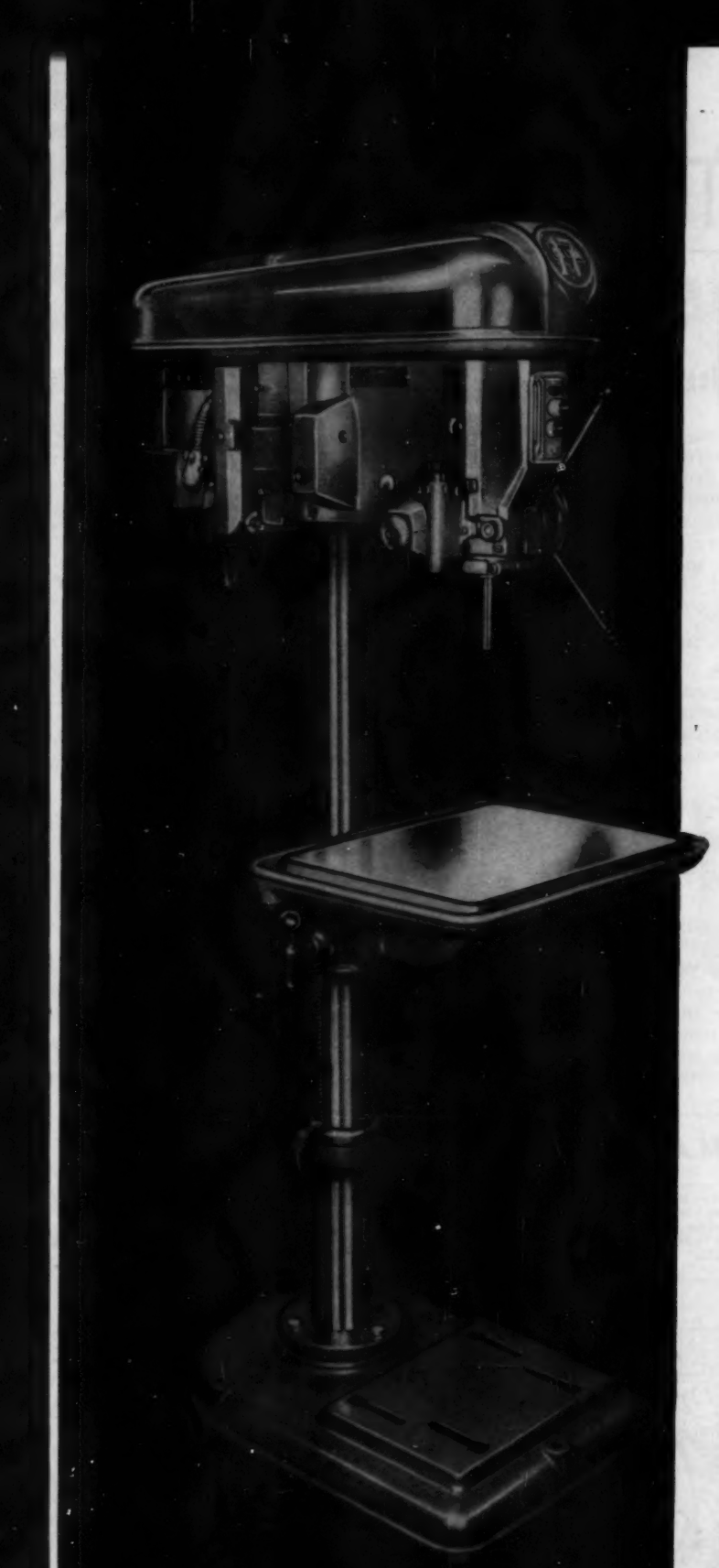
A solution . . .

Corrective action by Congress is both necessary and overdue. Increasingly serious competition for American manufacturers from low-cost foreign producers with favorable labor rates, makes such action imperative. Experience indicates, however, that we cannot afford to await a solution through the slow and cumbersome processes of government.

What you can do . . .

The quickest way to get relief for your own company is to increase the efficiency of your labor and to reduce the labor content of your product. Right here is where AM/MM comes in. Every issue is packed with ideas for producing your product better, faster and at lower cost. The application of automation and of numerical control, better methods of working materials, more efficient handling—all will help reduce your costs. Each one is dealt with in AM/MM. And the best way to reduce the labor content of your product is to be sure you are equipped with the most modern, efficient machine tools. AM/MM can help you here, too.

George Reppert



WALKER-TURNER 17" DRILL PRESSES

EVERYTHING NEW

but the price!

Because the entire line of W-T "Light-Heavyweight" 17" Drill Presses has been completely redesigned, it now gives you new flexibility, new accuracy and new convenience. You'll like the increased operating economy you get, but even more, you'll like the price tag. All 44 hand feed models of the "New 17" are being introduced at no increase in cost! And for less than $10.00* you can add revolutionary new Rockwell Power Feed and enjoy all the advantages of semi or fully automated drilling operations.

Only *you* can rate the value to your job of pacesetting features such as New Concept Depth Stop, New "Swing Away" Guard and New "Pivoting" Motor Mount. To see this machine in action visit your Walker-Turner Distributor (listed under "TOOLS" or "MACHINE TOOLS" in the Yellow Pages). Learn for yourself why more people in metalworking call Walker-Turner the *value* line.

**Slightly higher in the West.*

FREE BROCHURE pictures and describes the complete line of W-T 17" Drill Presses. Write: Rockwell Manufacturing Company, Walker-Turner Division, Dept. WB-21 400 N. Lexington Ave., Pittsburgh 8, Pa.

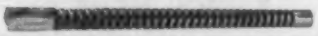
WALKER-TURNER
"LIGHT-HEAVYWEIGHT" MACHINE TOOLS
another fine product by
ROCKWELL

CIRCLE 202 READER SERVICE CARD

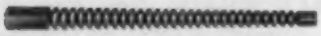
With Minute Man Keyway Broach Kits you can cut keyways in one minute for as little as one cent. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

SAVE TIME WITH THESE OTHER STANDARD STOCK BROACHES

Minute Man®



SQUARE BROACHES
For finishing 1/8" to 3/4" square holes in one pass in cast or drilled bore.



HEXAGON BROACHES
For finishing 1/8" to 3/4" hexagonal holes in one pass in cast or drilled bore.

ROUND BROACHES
For finishing 1/4" to 1" round holes in one pass in drilled bore.

SEND FOR CATALOG AND PRICE LIST

The duMont Corp., Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

duMont

LETTERS

to the editors

330 W 42nd St, New York 36, NY

Centrifugal Casting

Dear Sirs:
In your "Metalworking Report" section (*AM/MM*—Nov 28 '60, p3), we read an item on forming that tells about ceramic liners for centrifugal-casting flasks.

We are very interested in this, and we will be very grateful if you will give us all the information you can on the subject.

R. Calderon
Mexico City

Complete information is available from the developer of the process: American Cast Iron Pipe Co, P O Box 2603, Birmingham 2, Alabama —Ed.

Earlier Aluminum Engines

Dear Sirs:
Your story on the aluminum die-cast engines is interesting (*AM/MM*—Nov 28 '60, p144), and you might also be interested in the early efforts in this field. Few people now remember the aluminum-cylinder engine made in Cincinnati by Roberts during the first World War.

Roberts had formerly been with Hiram Maxim when he built his huge plane near London in 1890. This was not intended to fly but merely to test the lift of wings. It had multiple wings, the largest being 104 ft.

It also had a very special steam engine and boiler, probably the lightest per horsepower ever built. The plane itself weighed 8000 lb and ran on a test track 1800 ft in diameter. Guard rails were supposed to prevent its getting into the air, but they were not always strong enough to withstand the lift.

But to get back to Roberts, his engine cylinders were cast aluminum with no linings, as I recall. They were, of course, very short lived.

Somewhat later—about 1918—the Aluminum Co of America made some aluminum cylinder castings for Franklin. I saw the castings in their Cleveland plant, but I do not think they were ever put to a test. If so, I never heard of it, and I was a frequent visitor at their Syracuse plant.

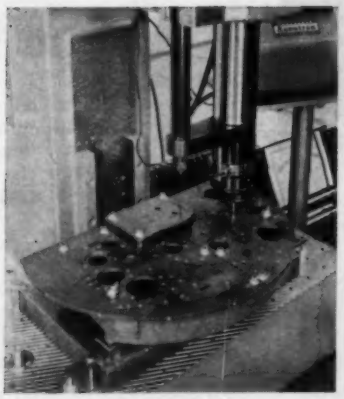
I have been trying to trace what happened to these test cylinders, so far without success. Nevertheless, Franklin did use aluminum

SHOPMATES

N. Jarvis

...UH... BERT... UH... WHAT WAS I DOIN' THE LAST TIME YOU SAW ME DOIN' SOMETHIN'??
THE LAST TIME HE WAS CAUGHT DOIN' ANYTHING THE WHIP HAULED HIM INTO SICK BAY FOR OBSERVATION!
M. JARVIS

Difficult hole location problems solved for short runs



At the Westinghouse Ordnance Plant, Lansdowne, Maryland, a Sheffield Coordinate Measuring Machine determines the true location of 18 holes in a magnesium integrator or gear box. Fifteen holes are checked to ±.00017; two holes to ±.00023; and 1 to ±.000075 (75 millionths).

Inspection with a height gage and setting master previously took two days and did not determine out-of-round condition. The Sheffield gage reduced the time to six hours including set-up and cooling out—and checked for out of roundness as well. Overall accuracy of the gage has proved to be within .000075 on both horizontal axes and in the 10″ vertical range. Repeatability is within .000010.

100% of the parts which passed inspection on this Coordinate Measuring Machine proved to be perfect in assembly, test, and field use. Short production runs of parts that vary widely in size and hole location, are easily handled.

Write for catalog number P-193 or check with your nearby Sheffield representative on your gaging requirements.

NEWS: **Before 11:00 a.m. on the first day of the NMTB Exposition in Chicago, September 6, 1960, a Fort Wayne, Indiana manufacturer bought a similar machine being demonstrated in the Sheffield booth. Additional orders continue to come in.**

The **SHEFFIELD** *Corporation* *Dayton 1, Ohio*

A subsidiary of The Bendix Corporation

Gages, Measuring Instruments, Automatic Gaging & Assembly Systems • Machine Tools • Contract Mfg.

For top efficiency in tank cleaning

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

First choice in heavy-duty tank cleaning—hard-working Oakite "24"

Users everywhere agree that their best way to clean iron and steel parts is to tank-soak them in a hot solution of heavy-duty Oakite 24. This hard-working alkaline cleaner gets under the dirt layers and literally tears the soil from the surface. Despite excessive soil contamination of solution Oakite 24 maintains proper pH level and provides long, effective cleaning action.

Oakite 24 is but one of a wide range of alkaline tank-cleaning compounds. Others include medium and light duty oil and grease removers; self-emulsifying solvent cleaners specially designed for removing buffing compound residues, pigmented drawing compounds and other tenacious burned-on solid-particle dirts and smuts. Also available is a useful selection of materials for cleaning brass, copper, aluminum, magnesium, lead, tin and zinc.

Which is best for you? Only you and the Oakite man together can decide. It depends on your equipment, the parts you process, the next production step. Ask the Oakite man. From over 30 materials, you're *sure* to get the one cleaner that works most efficiently for you. Write for Bulletins. Oakite Products, Inc., 34G Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

SCIENCE

over 50 *Est. 1909*

years' leadership in industrial cleaning

for the connecting rods to reduce reciprocating weight.

Don't forget that the Porsche motor has aluminum cylinders with a cadmium plating in the bore. These cylinders have tiny indentations, evidently rolled in before plating, to hold minute particles of lubricant. One that I saw torn down after over 60,000 miles had a perfect surface.

Fred Colvin
Point Pleasant, NJ

Shortly after writing us this letter, Fred Colvin, our 93-year-old editor emeritus, suffered a broken leg in an automobile accident. However, he is now home from the hospital and reported to be making good progress—Ed.

Value Analysis

Dear Sirs:

We would like to congratulate you on the presentation of the outstanding article, "The Impact of Value Analysis," Special Report No. 475 (*AM/MM*—July 13 '59, p117).

This article was well written and illustrated, and it is still most timely. The subject of Value Analysis is of vital interest to manufacturing and engineering personnel throughout the industrial world. Much more can and should be done in this area to acquaint more people with the techniques of Value Analysis/Engineering.

In our opinion, this article is so good that we would like to make reference to it in our training programs in Value Engineering.

George F Smith, *president*
Plant Management and Maintenance Co
Haddonfield, NJ

"It's so revolutionary it frightens me."

CALENDAR

Material Handling Institute. — Pacific Coast Show, Feb 22-24, Cow Palace, San Francisco, Calif.

American Institute of Mining, Metallurgical, & Petroleum Engineers—Annual Meeting, Feb 26-Mar 2, Chase-Park Plaza Hotel, St. Louis, Mo.

Society of Automotive Engineers National Automobile and Production Meetings, Mar 13-17, The Sheraton-Cadillac, Detroit.

American Society for Metals — Western Metal Show, Mar 20-24, Pan-Pacific Auditorium, Los Angeles, Calif.

Pressed Metal Institute — Spring Technical Meeting, Mar 22-24, Belmont Plaza Hotel, New York, NY.

American Machine Tool Distributors Association — Spring Meeting, Mar 23-25, Hotel Mark Hopkins, San Francisco, Calif.

Society of Automotive Engineers —National Aeronautic Meeting & Display, Apr 4-7, Hotel Commodore, New York, NY.

American Welding Society—Annual Meeting and Welding Show, Apr 17-21, Commodore Hotel and Coliseum, New York, NY.

National Institute for Disaster Mobilization—Mutual Aid and Disaster Control Seminar, Apr 18-20, Shamrock Hilton Hotel, Houston, Texas.

American Society of Mechanical Engineers—Metals Engineering Conference, Apr 23-26, Penn Seraton Hotel, Pittsburgh, Pa.

Metal Powder Industries Federation — Annual Meeting and Powder Metallurgy Show, Apr 24-26, Hotel Sheraton-Cleveland, Cleveland, Ohio.

American Institute of Mining, Metallurgical, & Petroleum Engineers—High-Temperature Materials Conference, Apr 26-27, Carter Hotel, Cleveland, Ohio.

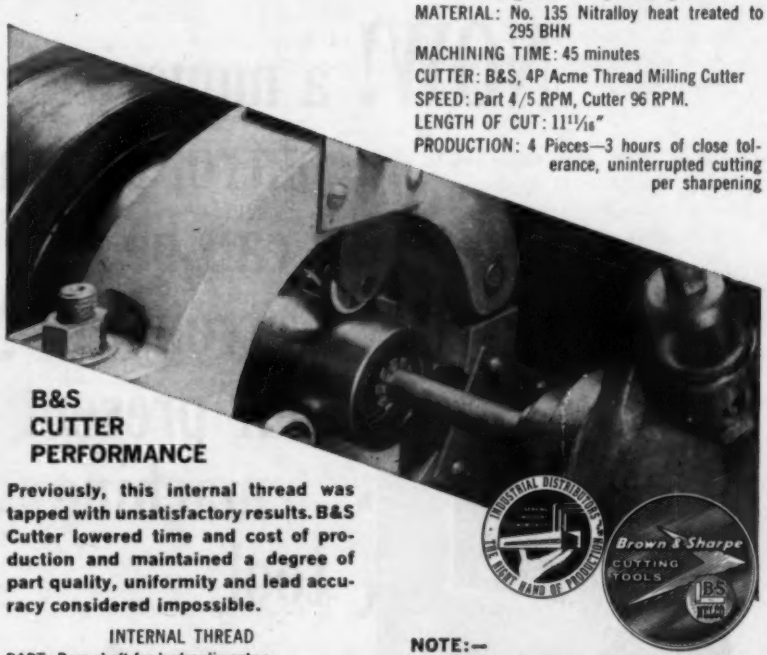
National Screw Machine Products Association—Annual Meeting, Apr 29-May 3, Summerset Hotel, Boston, Mass.

Impossible Milling Problem Routine with B&S Engineered Cutters!

B&S CUTTER PERFORMANCE

Original attempts to produce the piece by grinding from solid and by other methods were unsatisfactory. B&S Cutter produced pieces for a fraction of the cost of grinding. Part quality and lead accuracy exceeded requirements.

EXTERNAL THREAD
PART: Locking shaft for hydraulic gate
MATERIAL: No. 135 Nitralloy heat treated to 295 BHN
MACHINING TIME: 45 minutes
CUTTER: B&S, 4P Acme Thread Milling Cutter
SPEED: Part 4/5 RPM, Cutter 96 RPM.
LENGTH OF CUT: $11\frac{11}{16}$"
PRODUCTION: 4 Pieces—3 hours of close tolerance, uninterrupted cutting per sharpening



B&S CUTTER PERFORMANCE

Previously, this internal thread was tapped with unsatisfactory results. B&S Cutter lowered time and cost of production and maintained a degree of part quality, uniformity and lead accuracy considered impossible.

INTERNAL THREAD
PART: Ram shaft for hydraulic gate
MATERIAL: AISI 410 heat treated to 210-250 BHN
MACHINING TIME: 45 minutes
CUTTER: B&S 6P Acme Thread Milling Cutter
SPEED: Part ½ RPM, Cutter 200 RPM
LENGTH OF CUT: $3\frac{15}{64}$"
PRODUCTION: 3 Pieces—2¼ hours of close tolerance, uninterrupted cutting per sharpening

NOTE:—
In addition to the production benefits engineered into every Brown & Sharpe Milling Cutter—Cutter Service Shops in strategic locations and cutter engineering in your plant are two other EXTRAS to expect when you specify B&S.

SEND FOR CATALOG

For that EXTRA Edge in Production!

Brown & Sharpe

Cutting Tool Division
Brown & Sharpe Mfg. Co.
Providence 1, Rhode Island

Hughes two-axis control system, with positioning table, can be retrofit to almost any kind of drilling machine—single or multiple spindle—or to any other type machine requiring two-axis positioning.

Hughes numerical controls will reduce lead time, eliminate complex jigs and expensive tooling, and increase the productivity of your machine. And, they are easy to operate and service!

The Hughes Positioning Table is automatically operated from pre-programmed taped instructions. The table positions at a rate of 150 inches per minute; has repeatable accuracy to within 0.0002". Measuring circuit and drive motors are fully integrated.

Installation of this proven system is simple and fast. In many cases, all it takes is one day.

To find out more about how Hughes numerical controls can increase your profits, write, teletype (TWX INGL 4117) or call direct: Hughes Industrial Systems Division, P.O. Box 90904, International Airport Station, Los Angeles 45, California. For export information, please write: Hughes International, Culver City, California.

Creating a new world with ELECTRONICS

HUGHES

HUGHES AIRCRAFT COMPANY

INDUSTRIAL SYSTEMS DIVISION

NOW! a numerical control package that can be retrofit to your present machine tool

SPOT NEWS...

- **Gas-operated high-energy-rate forming equipment developed by Hermes Corp,** Pomona, Calif, will be built and distributed by Clearing Div of U S Industries, Chicago. Designed as production equipment with mechanized work handling, the forging machine is reported to be ready for manufacture. Extrusion and sheetmetal forming models are under development. John B Ottestad, generally credited as inventor of the Convair Dynapak, is president of Hermes.

- **Walsh-Healey determination of minimum wage rates for machine tool industry** is likely to run for about another year before any ruling becomes effective, U S Labor Department people predict. Change in administration could somewhat speed up or delay this timetable. Public hearing will be set in the spring, after which the data presented will be analyzed for some time.

- **Ingersoll Milling Machine Co is building two transfer lines for Opel** in Germany, it is said in trade circles—one for engine blocks, the other for transmission cases. Each line will machine and inspect the part, from rough casting to finished product. Lines will include units to be made by other builders, who already have orders from Ingersoll. Mattison grinding heads instead of face milling heads, for instance, will be used in the transmission case line for accurate facing of the casting.

- **The IAM has protested Rohr Aircraft's purchase of Japanese dies,** form blocks, and other tooling. Rohr says only a small amount of tooling ($1493) was purchased to determine comparability of work from another country. Quality control report will be forthcoming. Lockheed and Boeing are also reported to be interested in Japanese tooling.

- **$330.1 million worth of metal-cutting tools were shipped by 291 U S firms** in 1959, according to the Metalworking Equipment Division of the Business and Defense Services Administration. This total represents a gain of 4.8% over the previous year. The report, *Metal Cutting Tools: Domestic Shipments for 1959,* points out that twist drills, milling cutters, and threading tools dominated these shipments.

- **The Nationwide Committee on Import-Export Policy, a trade restriction body** headed by O R Strackbein, hailed a turnout of labor union observers—including machinists, electrical workers, and others—at the committee's recent Washington meeting. The committee laid plans for a Congressional drive against imports. Strackbein and several House members viewed labor interest as a significant addition to trade restriction pressures.

- **Largest horizontal forming press ever built has been delivered** to LeTourneau-Westinghouse Co by Lake Erie Machinery Corp, Buffalo, NY. Weighing 400,000 lb, this bulldozer will be used for form frame members and other components of earth moving equipment. Machine consists of three 850-ton presses which can work either in unison or independently.

- **Newly formed Metcut Research Machining Data Center,** Cincinnati, will study machining of difficult-to-machine materials such as tungsten and ultra-high-strength steels and new processes for removing metal. This new department of Metcut Research Associates Inc will be headed by Norman Zlatkin, director, and John Maranchik, Jr, assistant director. It is organized to collect, analyze, correlate, disseminate, and interpret machining data.

- **Strain-gage measurement of distortion and residual stress in welding** will be developed under an ASTME arc-welding research contract at Syracuse University. Project is co-sponsored by the Welding Research Council of the AWS.

A REPORT

on the superior tailor-made qualities of

G-E MAN-MADE DIAMONDS for METAL BOND WHEELS

A COMPARISON

In the electrolytic grinding of more than 311,000 miscellaneous carbide tools, six metal-bond wheels containing General Electric's latest type MBG Man-Made Diamonds were given a direct comparison to six wheels containing natural diamonds. The result shows a 22.5% superiority of G-E Man-Made Diamonds over natural diamonds.

Diamond Type	No. of Wheels	No. of Tools Ground	Avg. Wheel Wear Inches	Avg. Cu. In. Carbide Removed	Avg. Cu. In. Carbide Removed Per Cu. In. Wheel Wear	Efficiency Ratio
G-E MBG	6	160,713	.0605	90.885	70.2	122.5
Natural	6	150,496	.0644	80.181	57.3	100.0

A CONCLUSION

This comparison between G-E type MBG Man-Made Diamonds and natural diamonds is but one example of the superiority of this crystal developed specifically for metal-bond grinding wheels. The announcement of this new, blocky, tougher crystal, in 80-mesh and finer, with rough surface characteristics, was made by G.E. in April of 1960. In this short time reports reveal that MBG diamonds have shown outstanding results, not only in electrolytic grinding, but in the grinding of sapphire, slicing and dicing of germanium, cutting coarse-grained alumina and carbides.

Your own tests will demonstrate the worthwhile advantages of these new industrial diamonds in your metal-bond grinding operation. Call your grinding wheel supplier today. Metallurgical Products Department of General Electric Company, 11149 East 8 Mile Ave., Detroit 32, Michigan.

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CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

WASHINGTON...

Defense boosts metalworking . . .

Eisenhower's final defense budget provides a healthy shot in the arm for metalworking industries. It schedules the highest peacetime rate of military spending in US history—$42.9 billion for fiscal 1962 starting next July 1. This is $1.4 billion over the current rate of outlays.

Of this total, $14.4 billion is earmarked for production of hardware, 700 million more than this year. Expenditures for all major categories of procurement—aircraft, missiles, ships—will be increased. The expenditure figures, of course, reflect the volume of shipments.

Committee to advise on surpluses . . .

A committee to make recommendations on the impact of the sale of surplus machine tools on the commercial market is being formed in Washington. This permanent committee would meet one day a month and would consist of an equal number of machine tool builders, distributors and used machine tool dealers, plus representatives from the following government agencies: Defense, Commerce, Office of Civil and Defense Mobilization, General Services, Department of Health, Education and Welfare, and Small Business.

Two meetings of the proposed committee already have been held, the latest on January 30. Each month the committee would review the inventory of surplus machines by types. It also would review industry and government sales the previous month.

It would suggest the quantity of machines to be offered for sale by the government in each type of machine during the next 90 days.

This committee would replace the impact teams that heretofore have gone into the field whenever fairly large quantities of government machines have been marked for disposal.

Surplus problem is becoming more important because a surprisingly high ratio of machines are products of the Korean war period and have never been used or have been operated only a little. Example: 241 machines of one type, now in excess at South Charlestown, W Va, are being analyzed by armed services to decide whether they can be utilized somewhere within the government.

Incentives to investment . . .

Incentives to investment in US plant and equipment are high on the list of Kennedy's economic proposals, both as anti-recession measures and to stimulate long-term growth of the economy. **No one knows for sure which ideas** will win out. Liberalized depreciation allowances as such may not be favored.

For instance, the task force report on tax policy headed by Stanley S. Surrey of the Harvard Law School (a report which has not been made public) recommends giving business a direct tax credit for capital investment over and above what its depreciation allowance might be for a given year.

The idea would work like this: Suppose a company spends $200,000 on capital equipment during a year, but its depreciation allowance is only $125,000. Then the company would be allowed to deduct a certain percentage of the $75,000 difference from the final tax it would otherwise pay the government.

Certainly some such proposal is bound to be recommended by Kennedy, since spending for capital plant and equipment has been one of the soft spots contributing to the present recession, but it is also a factor in stimulating long-term economic growth.

Overseas manufacturing . . .

Overseas investment stimulated by government incentives seems likely to be changed. That's the tone, at least, that Secretary Dillon took during confirmation hearings before the Senate Finance Committee, Dillon agreed that tax deferral on overseas manufacturing by US firms (particularly in industrialized countries that no longer need US help) amounts to an interest-free government loan of the amount of the tax. Dillon said the time for such tax changes is sooner rather than later, and said something might be forthcoming by April.

Dillon said that changes in depreciation allowances are necessary because European factories are becoming more modern than our own, and "This can't be allowed to continue."

Aid to depressed areas . . .

Distressed areas are getting prompt attention from the new administration. A law for loans and grants to help bring industry into such areas, to train workers and the like will be promptly passed by Congress. The bill authorizes some $392 million for all this, but it will take time to create an organization to handle the program and get things moving after Kennedy signs it. It may be a year or so before the first of this money is spent.

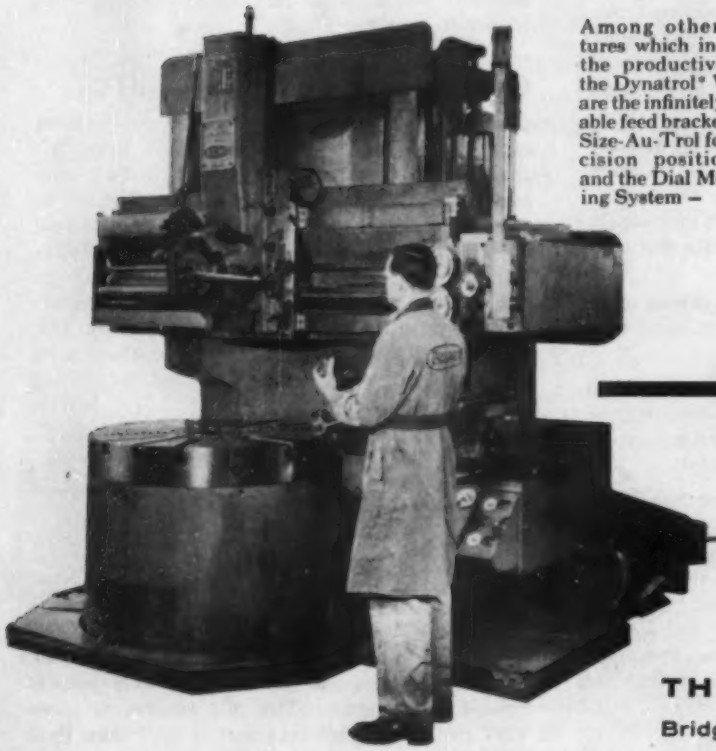
FINGER-TIP CONTROL

Increases Productivity of...

BULLARD

DYNATROL*
VERTICAL TURRET LATHES

Directional control of all head motions in feed on traverse, either horizontally, vertically or at any 45° angle, as well as table start and stop from a lightweight portable pendant, is a distinct production advantage.



Among other features which increase the productivity of the Dynatrol* V.T.L. are the infinitely variable feed bracket with Size-Au-Trol for precision positioning, and the Dial Measuring System –

It allows the operator to always be in the most advantageous position in relation to the work and eliminates the necessity of climbing for buttons or levers. By reducing operator fatigue and increasing his efficiency, more metal is removed per hour with a lower cost per piece.

*TRADE MARK

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CIRCLE 209 READER SERVICE CARD

DETROIT...

Doleful forecast . . .

Despite optimism that is still expressed in every official quarter, the fact remains that no more than 1,400,000 passenger cars are scheduled to be built this quarter. And this total may be further whittled.

It is not a sales recession. Production cuts are a final admission that 1,000,000 unsold cars in dealer hands is 300,000 too many in a normal year. 15 makes of cars are in over 50-day supply (one make has reached—and receded from—a fantastic 150-day stock), and it is considered too early in the season to start widespread incentive contests.

Truck production, on the other hand, is starting to turn upward with about 270,000 units targeted by March's end. Intense demand is developing for the new compact models, such as Ford's Econoline and Chevrolet's Corvair 95. International Harvester will give this market a further fillip with its new "Scout", a jeep-like utility vehicle in basic form but with optional panels and sections that can quickly convert it to a variety of uses.

Healthiest passenger cars, saleswise, are Cadillac, Thunderbird, Lincoln, Corvair and Tempest. Of the imports, Volkswagen and Mercedes-Benz continue to hold their own in the face of a declining market.

Anyone for performance?

Once again February will see a renewal of NASCAR'S annual speed weeks in Daytona Beach, Florida. This year, however, there are more than the usual indications of active Detroit participation.

Back in 1957, it will be remembered, automakers passed the so-called AMA resolution which condemned participation in, or advertising thereof, the results of stock car racing or other contests emphasizing speed. Each year since, adherence to this well-intentioned agreement has slipped in direct proportion to declining sales of cars that are capable of racing and/or speed.

It could be said—and it has been—that the resolution has retarded automotive progress and sales. Sales in this case being to that substantial minority who buy on the basis of proven performance. As to progress, it is certain that if the horsepower race had continued unabated, makes such as Oldsmobile, Chevrolet, Ford and Pontiac would not now be using their original V-8 engine designs.

In accordance with NASCAR rules, automakers have already announced specifications for a wide variety of "powerpacks." Buick, for example, is offering a kit that ups horsepower of its compact Special from 155 to 185. Dodge gives the option of a 225-cu-in. aluminum engine on its Lancer.

New aluminum engine . . .

Normally an automaker will introduce a development as significant as a die-cast aluminum engine with fanfare and press agentry. Dodge's however, sneaked into public view at a recent SAE meeting in Detroit.

It is a 225-cu-in., limited production option for the Lancer. It is basically similar in design to the existing slant-six, but weighs 81 lb less.

The block is die-cast around iron cylinder liners by a specially designed, 2000-ton casting machine. SAE 303 diecasting alloy (containing 3 to 4.5% copper and 10.5 to 12% silicon) is used. Machining time is approximately 50% less than on the cast-iron counterpart. The engine costs a retail customer $43.75 extra.

Riding on air . . .

The record breaking crowd of 21,000 engineers who attended SAE'S recent International Congress and Exposition in Detroit learned of remarkable progress in the development of ground-effect machines.

Because "GEMS" operate best over water, they are of particular interest to the military services for use in amphibious operations. Present wheeled assault craft have a maximum water speed of 9 knots and are of relatively deep draft. Prototype GEMS undergoing military tests have attained over-water speeds of 90 knots.

There are numerous varieties in existence or in the planning stage, but they are basically differentiated by low and high-pressure air lift systems. The first can maneuver over relatively rough terrain or water as it hovers between one and two feet up. The latter must operate on a rail.

Low-pressure, or plenum-chamber GEMS, are still troubled with a lack of maneuverability that will keep them off city streets for a while. One speaker with operating experience compared turning a corner in a GEM to a similar maneuver by a pig on roller skates.

Ford's Levacar, a ground-effect machine designed to operate on a rail is stirring up much interest with major railroads. It is considered to have a rich potential as a 300-mph passenger and freight carrier between so-called "Golden Triangle" cities such as Pittsburgh, Washington and New York. The company is planning to build a full-scale test track on its proving grounds for further evaluation.—**Don MacDonald**

GREENLEE

- Special Purpose Machines
- Transfer-Type Processing Machines
- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines
- Trim Presses
- Woodworking Machines and Tools
- Hydraulic and Hand Tools

COOPERATIVE TEAMWORK MAKES THE DIFFERENCE

Through every phase of the construction of a Greenlee transfer machine, Greenlee engineers maintain a close contact with you, the customer. They are strong on the buyer's viewpoint . . . know what cost-conscious management wants. They stay on the job from the time of initial planning until your machine is operating at full efficiency. This last phase—the proving out period—is especially important. Greenlee men are extremely helpful in bringing your machine up to full production . . . training your operators to keep it producing profitably. Call Greenlee. Let them show you how cooperative teamwork can benefit you.

GREENLEE BROS. & CO. 1943 MASON AVE. ROCKFORD, ILLINOIS

AIRCRAFT and MISSILES...

TRENDS

Cutting subcontracting costs . . .

Four defense subcontractors have set up a single firm to bid for prime contracts on missile, rocket and weapons systems. Their aim is to trim overlapping prime-subcontractor costs.

The new firm, United Systems Corporation, expects to cut costs "through elimination of pyramided general and administrative overhead costs, and anticipated reduction of profit at the prime-contractor level." Savings up to 15% are anticipated.

Member firms of USC are Amcel Propulsion Inc, a subsidiary of Celanese Corp of America, propulsion specialists; CTL Division of Studebaker-Packard, builder of nose cones, heat resistant structural members; Technology Instrument Corp of Acton, electronic instrumentation specialists; and Merz-Chambers Corp, special machinery and tool manufacturers.

Under USC's plan, the corporation will earn no profits. Earnings will go to the four member companies in their roles as subcontractors. A general manager and his staff will coordinate proposals, purchasing, quality control, feasibility, and assignment of projects.

Research and development efforts . . .

Under the 1962 federal budget submitted by the previous administration, major R&D efforts will emphasize Air Force ballistic missiles, the B-70, new cargo aircraft for MATS and development of certain Navy aircraft. Though funds for aircraft programs are declining, there is provision for development of a new VTOL transport aircraft prototype and for support of the aircraft nuclear propulsion program.

Funding for Dyna-Soar will be at a higher level than in 1961, and the Army will initiate development of a new surveillance aircraft.

Development of missiles and related equipment continues to be a major portion of research, development, test and evaluation, although funding is at a lower rate than in 1961. $250 million is provided for Nike-Zeus, and substantial funds are provided for Pershing, Mauler, a longer-range version of the Polaris, Sky Bolt, Bullpup, and a new, highly mobile surface-to-surface missile to support battle groups in combat.

Military space and satellite development increases in importance, with substantial funds earmarked for development of Midas, Samos, Advent and Transit.

Major civil space programs in the next fiscal year include more advanced Tiros and Nimbus satellites; continuation of the Mercury system; the Ranger unmanned lunar exploration program, leading to the Surveyor and Prospector series; and continued development of the Centaur and Saturn launch vehicles.

B-70 assembly starts in March . . .

North American Aviation expects to begin a full-scale assembly program on the B-70 bomber at its Palmdale (Calif) plant in March.

Tooling is now being set up at the Palmdale plant. Operations call for a move into additional facilities in the area by midsummer and a gradual buildup to a work force of about 1000 by the end of 1961.

Biggest item in the current moving schedule from the company's Los Angeles Division is a 45-foot-long jig section for the bomber's aft fuselage.

Thirty-six feet wide and 20 feet high, the section will be disassembled and carried to Palmdale in five semi-trucks.

Nuclear space engine possible . . .

The nation is ready to begin work on a flyable nuclear rocket engine that will significantly increase the payload capability of space vehicles of the current decade, says T F Dixon, vice-president of research and engineering for Rocketdyne Div of North American Aviation.

Nuclear rocket engines would virtually double the "specific impulse" or efficiency of engines for space flight. Specific impulse is roughly analagous to miles per gallon of gasoline; it is a measurement of the pounds of thrust produced by the combustion of one pound of rocket propellant per second of time.

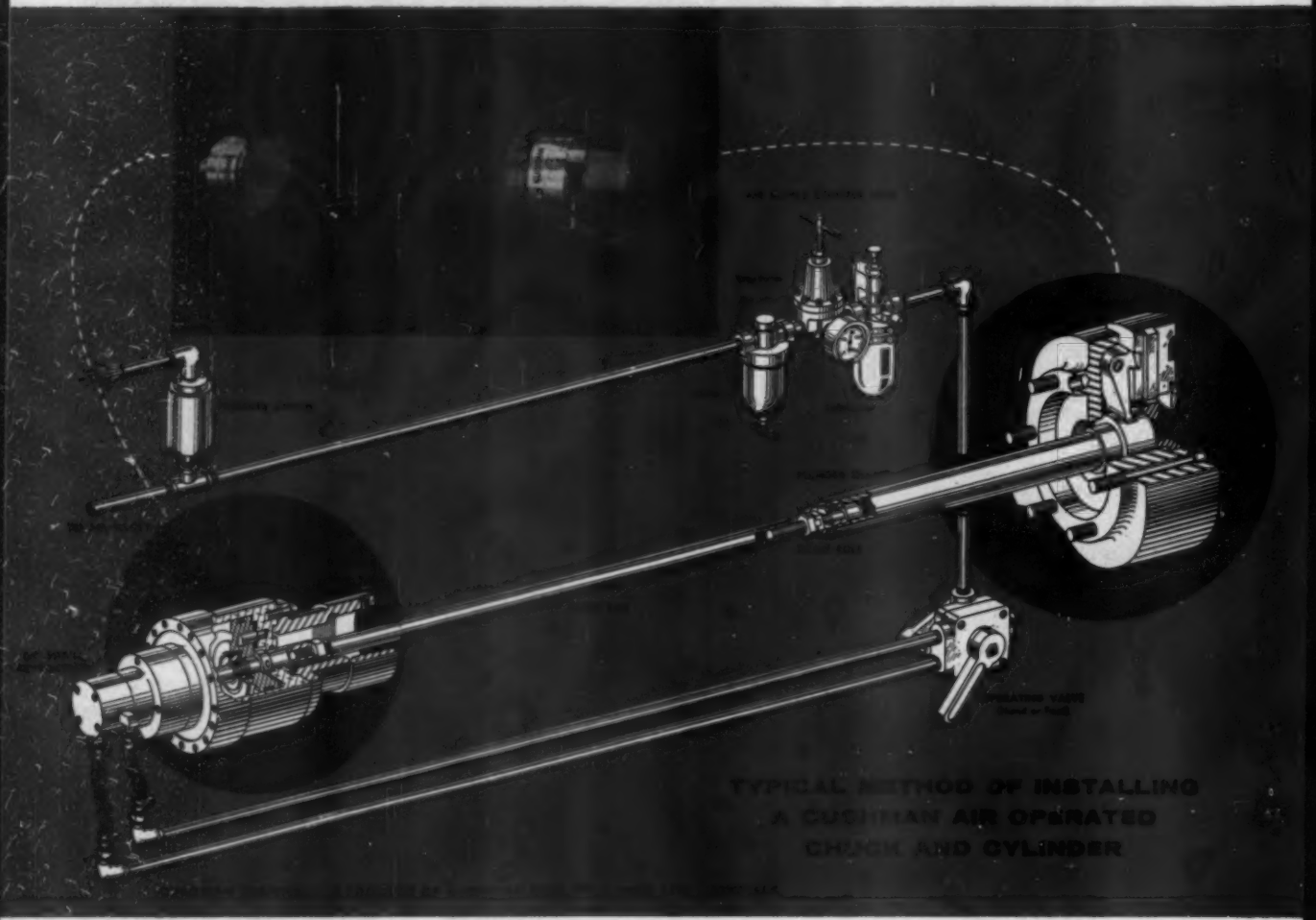
Safe and useful nuclear rocket engines are now possible, says Dixon, as the result of information developed by the Los Alamos Scientific Laboratories in its Kiwi test program. Compact nuclear reactor designs and their ability to provide enough heat to convert liquid hydrogen into an efficient propulsive force were analyzed, and problems once considered prohibitive were proven by the Kiwi program to be solvable "in a short time with a little extension of the present state-of-the-art."

Actual hardware designed to nuclear propulsion specifications has been successfully tested both by the Los Alamos labs and by Rocketdyne.

Get a production bonus with

CUSHMAN

AIR OPERATED CHUCKING EQUIPMENT



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SIMPLE TO INSTALL • EASY TO OPERATE • LOW IN COSTS

Yes, Cushman Air Operated Chucking Equipment automatically provides a bonus of increased production by eliminating operator fatigue—the principle cause of rejects . . . raising production rates with better accuracy and higher efficiency . . . decreasing floor-to-floor time. Safe, positive work piece grip permits accurate control of jaw pressure for the material being machined.

Write today for Bulletin No. PO-66D and see for yourself how you can increase production and reduce machining costs on both new and old equipment at a surprisingly low investment.

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THE CUSHMAN CHUCK COMPANY 5 HARTFORD 2, CONN.

MANUFACTURERS OF CUSHMAN POWER WRENCHES, MANUALLY OPERATED CHUCKS AND FACE PLATE JAWS

MACHINE TOOLS...

Shipments to Russia suspended...

Export licenses obtained by Jones & Lamson Machine Co and Bryant Chucking Grinder Co to ship around $2 million of grinding machines to Russia were suspended by the Department of Commerce before the Kennedy administration took office.

This action was announced at a time when both firms were far along in building the machines, which conform to Moscow's specifications.

The licenses apparently were held up at the request of the Senate Internal Security Committee which wanted to review the situation prior to giving clearance. Action was to have been taken prior to change in administration. But it was not.

Whether the licenses will eventually be restored remains to be seen. The government, it is reported, disclaims financial responsibility, despite the fact that the licenses were granted prior to the orders being placed.

The license suspensions were part and parcel of a hardening attitude toward trade in machine tools with Communist countries.

The policy thinking is about like this: Competition for supremacy between the United States and Russia stretches over the economic field as well as military and scientific areas. The determining factor therefore in deciding whether to ship machine tools to Russia should be economic as well as strategic.

If maintained under the Kennedy regime, this policy means a virtual drying up of what at best has been only a trickle of business, but which has promised to open up into something more.

There are those, however, who centend that the stringent restrictions now in force will be lifted after the Kennedy people get their bearings.

A number of U S machine tool builders have spent considerable time and money in Moscow soliciting orders in the belief that machines not on the Positive (forbidden) List could be shipped to Russia.

To aid underdeveloped countries . . .

A plan to send surplus government machine tools to underdeveloped countries has been proposed in Washington official circles. Competent machine tool men would decide what types of machines are required by a specific country, select these types from surplus, and have them rebuilt to predetermined standards.

The rebuilt machines would be shipped to government warehouses in underdeveloped countries for distribution. Rebuilding expense would not exceed 30 to 40% of acquisition cost.

The machines selected would be completely operable, competitively priced, and available in the country to which they are to be sent. Shipping charges would be included in the price to the underdeveloped country, which actually would not pay for the machines because payment would be made out of U S loans to that country.

Idea back of the plan is simple. Russia and some western European countries are providing new machine tools to underdeveloped countries. United States cannot compete pricewise. Yet the country that furnishes the initial machine tool requirements can be expected to be the source of future supplies to these countries.

Adoption of the plan would help solve the surplus problem here and would assist underdeveloped countries to achieve economic independence.

What Arthur Little study shows...

Though still not made public, the Arthur D Little pilot study for BDSA and OCDM is purported to show that most metalworking companies give relatively low priority to intelligent and continuous planning for keeping their production equipment modern.

Most companies, in fact, do not have a well-defined replacement policy.

The pilot study hardly encourages Little to pursue a more comprehensive study on the same subject. But Little is believed to be recommending that several new avenues in related fields be explored.

The Arthur D Little study was part of a five-point program announced almost a year ago by OCDM to determine how the nation's mobilization base might be strengthened.

Sheldon gives 5-year guarantee . . .

Sheldon Machine Co Inc, Chicago, has notified its distributors that, effective January 19, it is guaranteeing its lathes, turret lathes, milling machines, shapers and other products against defective material and workmanship for a period of five years.

All parts, accessories and electrical equipment supplied by Sheldon but bearing the name of some other manufacturer carries the same guarantee for one year.

Sheldon R series lathes and new 3R turret lathes, with the new guarantee, are designed and priced specifically to compete successfully against foreign machines in the U S market.

ONE KEY TO COST CONTROL IN '61

Savings like these through Metalogics*

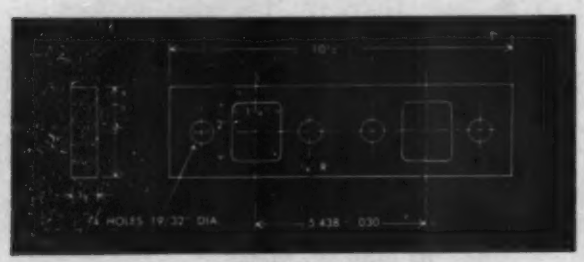
Look at these random examples and see how Ryerson Metalogics sparks real savings for hundreds of companies—in helping to search out new materials, new methods, new machines that will do the job better.

You can count on Ryerson for practical, unbiased recommendations because we offer you:

1. Exceptional knowledge of metals and their characteristics, gained through a century of service to industry as a supplier of metals and machinery for metal fabrication.
2. The nation's largest stocks of steel and aluminum —plus unsurpassed service on industrial plastics.

Your Ryerson representative is "Metalogics-trained" to help you value-analyze selection, fabrication and application problems. Get his constructive ideas soon, and see how he can help you select and apply material from our vast stocks. It's the "Metalogical" thing to do.

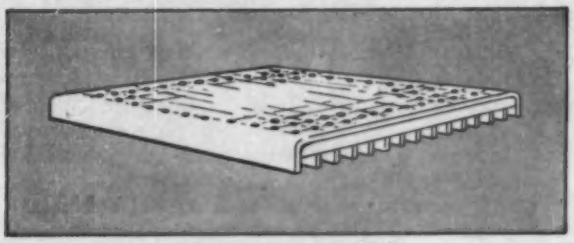
**The Ryerson science of giving optimum value for every purchasing dollar.*



Saved: $100 per thousand

PROBLEM: Muffler manufacturer required accurately finished mounting plates made from ⅜" x 3" bar. Cutting bars to size, burning 1¼" x 2" holes and drilling four 19/32" holes proved time-consuming and expensive.

SOLUTION: Ryerson recommended that they eliminate cutting, burning and drilling operations by stamping the part from Ryerson forming-quality plate. One operation instead of three cut costs $100 per thousand pieces and quickly justified the small initial investment in dies.



Suggestion saves 85%

ASKED FOR: Customer wanted 1" hot rolled plate to cover about 80' of 24" open trench. Plate was to be cut into 24" x 27" segments—each containing 900 ⅜" holes to filter the product.

RECOMMENDED: After studying application and costs, Ryerson recommended a design combining perforated light plate, formed to channel shape, and grating for structural support. Ryerson's experience and imagination saved 85% of the original cost.

Machine cut rings solve problem

PLATES REQUESTED: Ryerson was asked to bid on supplying ¼" Type 410 stainless in 27⅛" square plates. Material was to be used for orifice plates for 16" burner, subjected to elevated temperatures.

RINGS RECOMMENDED: Going beyond material specs, the Ryerson representative found that the customer intended to cut plate into 27⅛" diameter length with 13.120" bore—and then mill 12 slots in outer diameter for expansion relief. Knowing the application, Ryerson recommended supplying machine-cut rings in which slots could then be punched rather than milled. Production savings enabled switching to Type 304 at less cost than Type 410 with slots milled.

2 metalworking machines for the price of 1

A fabricator of stainless steel kitchen equipment was recently in the market for a new squaring shear. The one under consideration had a gap-type frame which would enable him to do an important notching operation—necessary for certain sink tops. After careful study, a Ryerson machinery specialist recommended *two* pieces of equipment instead of one at no increase in total cost. The first, an under-driven shear. The second, a universal-type sheet metalworking machine that would do the required notching, plus many other jobs—adding versatility to the entire operation.

Production upped 30%

BEFORE: Job shop was using MT 1015 tubing in the manufacture of this coupling. Machinability was satisfactory, but rising costs of operation led to a search for ways to economize.

AFTER: Careful study by the Ryerson representative brought about a change in material. He recommended using Ledloy® 170 tubing, which increased machining speed to 170 sfm and stepped up production 30%. Ryerson's stocks include the widest range of fast-machining alloys.

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MATERIALS...

Specialty auto steels...

Specialty steels are assuming a major role in upgrading the performance and appearance of modern automobiles, according to Clyde G Davies, VP, Armco Steel Corp. Speaking at the SAE Automotive Exposition, held in Detroit last month, Mr Davies predicted far greater use of these alloys in the years ahead.

"In the early years of the auto," he said, "only two types of alloy or specialty steels were used in the automotive industry. Of the 100 or more varieties of steel used in today's cars, many are new alloys developed especially for automotive applications." Armco 21-4N stainless steel, developed for exhaust valves, is one example. Other examples include high-strength steel for bumpers, stainless-steel trim, vinyl laminated steel interior panels, and zinc-coated structural members.

Stainless-steel seems to have the most immediate growth potential for automotive use. In addition to more common body applications, it is being considered for anti-smog catalytic and afterburner units. Also, the Tyce-Taylor high-performance engine has a stainless-steel block plus 21-4N exhaust valves. To a very high horsepower-per-lb ratio is added improved corrosion resistance and greater strength.

Corrosion control imperative...

Corrosion damage in automobiles has been a bugaboo to auto builders from the industry's beginning. In spite of intensive research efforts, the problems have multiplied faster than solutions are forthcoming. S K Coburn, J W Stewart, and R B Mears, of United States Steel Corp, discussed these problems and solutions at the SAE Congress.

Auto-body corrosion results from two factors: The relatively large ratio of exposed body area to the thickness selected for the body structure, and the difficulty of adequately applying protective coatings to the complex body and chassis structures. The latter problem has grown more serious with increased use of salts for controlling snow and ice and with ever more complex structures in unit-body-frame construction.

Box sections and other restrictive configurations make adequate painting difficult, trap corrosive contaminants, and impede the ventilation needed for rapid drying. Three methods provide protection: an alloy that reacts with the environment to provide a surface compound which serves as a protective barrier, applied protective coatings, and cathodic protection.

No simple economical solution to the general problem of corrosion is available. However, considerable progress toward reducing the amount of corrosion sustained by automobiles in the past can be achieved by taking maximum advantage of the current developments in the field of surface protection and the enhanced corrosion-resisting properties of high-strength low-alloy steels. Combined use of differentially or equal-side zinc-coated steel sheet in box sections; application of zinc-rich paints to underbody components; thorough preparation of the steel surface followed by adequate use of phosphate pretreatments, the thorough application of sealers and currently available primers and topcoats should help ensure good surface protection.

Plastic body structures...

Forward-thinking scientists in all chemical companies concerned with tomorrow's polymers and plastics are convinced that the automotive engineer concerned with body structures in the mid-'60s must familiarize himself with a whole new family of materials. Names such as polyolefins, styreneacrylonitrile copolymers, polyesters, epoxies, polyurethanes, polyvinylchloride, polyacetals, fluorocarbons, polycarbonates, and silicones, among others, must be part of his working vocabulary.

One-piece moldings of thermoset, high-density polyethylene; of expandable styrene foam; and of glass-fiber-reinforced polyesters are closer than most people believe. By 1970, say people in the know, these moldings will be commonplace. R T Stevens, I J Gusman, and I B Cohen of J P Stevens & Co Inc, New York, told the SAE audience that a body-structure breakthrough is imminent.

The "science of preclusion" which seeks to eliminate the need for exhaust systems, mufflers, radiators, multiple fluid systems, electrical wiring, harnesses, generators, wheels, windows, and even doors will find help in plastics. Thermoelectric cooling, printed circuits, electroluminescent lighting, ground-effect and air-cushion supports, fuel cells, honeycomb, etc, will combine with plastic structures to offer undreamed of design possibilities.

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WHAT'S AHEAD... in Metalworking

TRENDS

No upturn seen before second quarter...

Output in the metalworking industry is going along at about the same rate that prevailed in December. It even may be a bit higher than then. This means that the prevailing production rate is about five points below the average during the past year. And 1960 turned out to be the best peacetime year on record.

Hardly anyone is counting on any pickup until the second quarter, if then. And it is possible that February may bring a dip below the January level.

Steel producers report the current picture is about on a par with December production levels. Automotive cutbacks have put a damper on what could have been an early, though small, pickup for the steel industry. But steelmakers are optimistic over the possibility of heavy orders from the construction industry. These orders may start coming in by March.

Auto parts production currently reflects activity in Detroit. A spokesman for one parts manufacturer reports that his company estimates 1961 model sales will run about 5.7 million units, and is adjusting its sales forecast to that figure.

Appliance manufacturers, after a rough year in 1960, are beginning to detect glimmerings of an upturn. Some companies are rehiring employees that had been furloughed, others have cancelled scheduled layoffs. One large manufacturer reports that the first three weeks of January were "better than December," but still 3% to 4% below the same time last year. What pickups have been noted so far have been primarily in dishwashers and ranges.

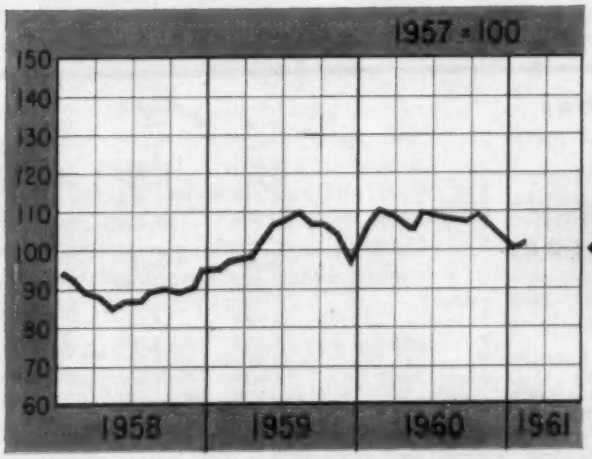
Work in metalworking job shops ranges from "slow" to "fair," but there is growing optimism that there will be a pickup during the second quarter. On the whole 1960 was not as good a year for these shops as 1959, but 1961 is expected to be up 8% to 10% over 1960.

Metalstampers describe business in about the same terms as the metalworking job shops. Stampers say 1961 will be a fair year—better than 1960, maybe better than 1959. One reports that business is now extremely competitive and that prices are often below the point where a reasonable profit can be made.

Bearing producers are particularly hard-hit. One major producer has made drastic reductions in production personnel. Others report business down 10% to 15% from the same time in 1960, and 1960 was not a good year. The forecast is for a pickup in the second half of 1961, and year-end results should just about equal 1960 results.

The outlook for the tool and die industry, as reported by the NTDPMA, is quite spotty. Several areas report that reinstatement of the B-70 program has resulted in some new business, but on a national scale, business is still slow. Captive shops are just keeping busy and there is not much left to sell outside. Orders in the latest month were 21% below those of the comparable period a year ago.

Shipments of industrial fasteners dropped off slightly in the latest month, reaching a level of 81% of the 1965-58 average, according to the most recent report from the Industrial Fasteners Institute.

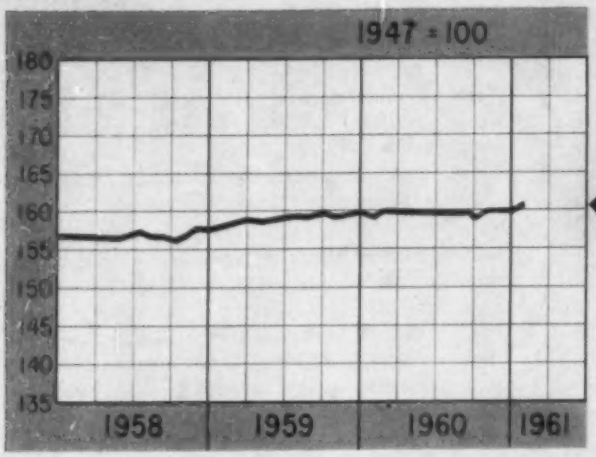


AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JAN Estimated	DEC Preliminary	NOV Revised	DEC Year Ago
Total Index	**100**	**99**	**101**	**103**
Machinery		**95**	**98**	**104**
Electrical Machinery		**108**	**108**	**116**
Autos		**97**	**103**	**94**
Other Transportation		**89**	**90**	**91**
Other Metalworking		**104**	**106**	**107**

TRENDS WHAT'S AHEAD... in Business



160.2

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JAN Estimated	DEC Preliminary	NOV Revised	DEC Year Ago
Total Index	**160.2**	**159.9**	**159.7**	**159.6**
Metalworking Machinery	**194.8**	**194.5**		**189.7**
Other Machinery exc. Electrical	**173.4**	**173.6**		**172.3**
Electrical Machinery	**158.8**	**158.8**		**162.1**
Fabricated Metal Products	**148.0**	**147.6**		**148.1**

The economy weathers a squall...

Last year ended with personal incomes sliding. From a peak annual rate of $409.5 billion in October, total personal income had slipped to a $406.7 billion rate for December. Clearly this is not a good omen for the business outlook.

Still, you should not exaggerate the impact of such a cut. Nor should you underestimate the economy's holding power in the face of such adjustments.

Actually, a drop in personal income was almost inevitable, considering the reductions in factory output in recent months. By December the Index of Industrial Production had dropped to 103 (1957=100), from the all-time high, 111, set early in 1960.

Rising unemployment has accompanied production cutbacks. Now joblessness has spread to about 7% of the labor force—more than at any other period since late 1958—reducing incomes.

Increasing employment in other sectors of the economy offsets partially the effect of reduced factory job openings. But to the unemployed, built-in stabilizers such as unemployment insurance make loss of a job somewhat less serious.

For reasons such as these, the economy can weather relatively sharp cutbacks in some sectors. Consumers, for example, continue to increase their outlays though a substantial number are without jobs. And this occured in the final quarter of 1960, when they increased their spending rate by almost $4 billion.

Of course, it's likely that most of the added consumer spending at such times is for nondurables (food, clothing) and services (such as housing), which are indispensable as families grow. But purchases of major durables, such as appliances, can often be postponed.

Thus the current situation does not offer much promise of quickly improving durable sales. But there is clear evidence indicating that the economy will not stumble badly before regaining its foothold and climbing to new highs.

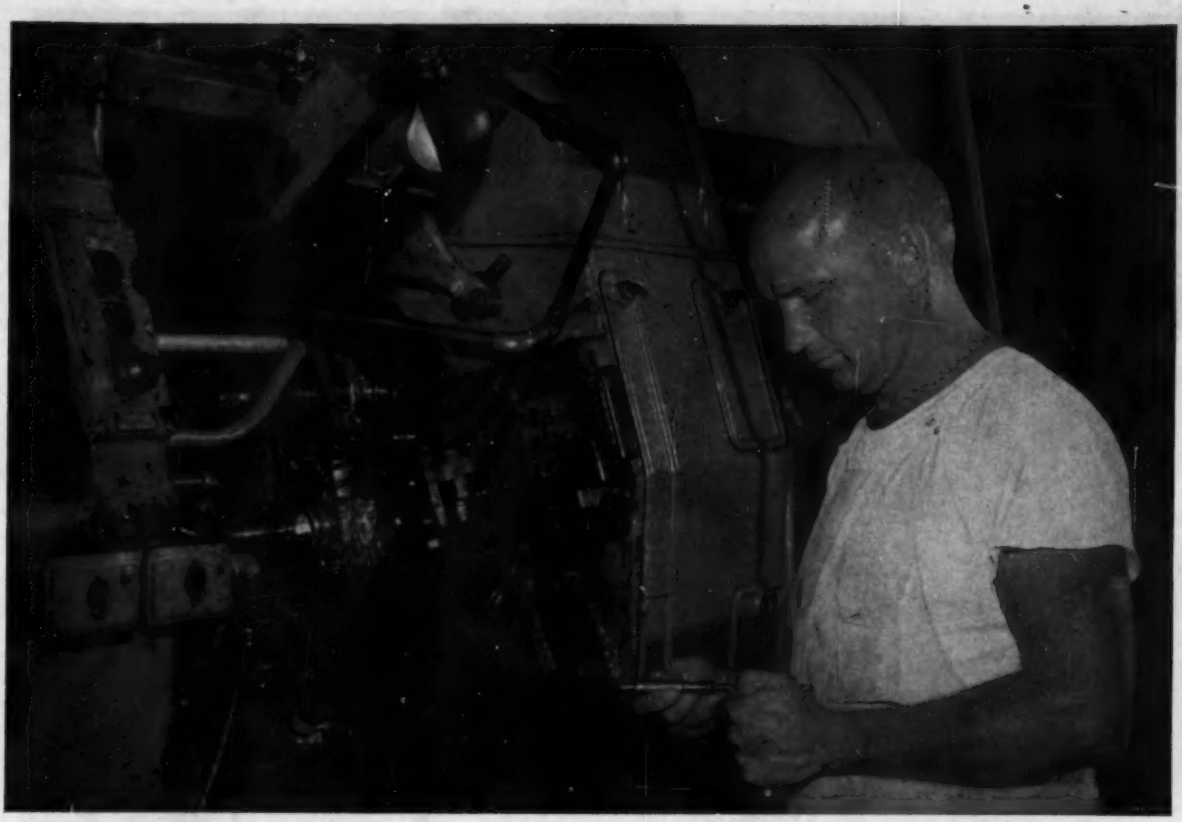
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	143.7	144.3	160.5
Steel ingot operation (thousands of tons)	1,499	1,482	2,727
Electric power output (million Kilowatt hours)	14,817	14,684	14,523
Production of automobiles	96,436	110,808	175,060
Engineering construction awards (Eng. News-Record — Thousands)	75,480	84,546	55,003

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1957 = 100)*	103	105	109
Index of durable manufacturers production (1947-1949 = 100)*	96	98	107
Durable goods manufacturers' sales millions*	13,750	14,080	13,479
Machinery manufacturers' sales, millions*	4,540	4,590	4,717
Durable goods manufacturers' new orders, millions	13,470	13,740	13,721
Machinery manufacturers' new orders, millions	4,490	4,400	4,673
New Orders for Nonelectrical Machinery (1950 = 100)*	159	162	163
New contracts for Industrial Construction (1950 = 100)*	190	207	132

* Seasonally adjusted



Manufacturer increases tool life 20% with CLEARTEX

—saves $100 monthly on oil alone!

The Master Vibrator Company of Dayton, Ohio—maker of portable heaters, cement finishers and other contractor equipment—was having trouble with lube oil diluting the cutting oil on their automatic screw machines. There were too many tool regrinds and too many rejects. A Texaco Metalworking Engineer suggested a test of Cleartex. They agreed to using a 10 gallon sample on one automatic. That was November, 1959.

In one month they were convinced. By using Cleartex on both cutting and lube sides they solved their problem —no more dilution of cutting oil. And look at the results: Tool life increased 20%; actual monthly savings on oil of $100; less carry-off on chips; cleaner machines; fewer rejects; happier operators and delighted management! No wonder they switched entirely to Cleartex and are now regular users of 10 drums a month!

Why not send for your copy of Texaco's new booklet —"Cleartex in Automatic Screw Machines." This illustrated guide will show you how to end dilution of cutting oil—and the profit-draining costs in rejects and tool life it causes. Just mail the coupon. Or if you want immediate savings, ask to have a Texaco Metalworking Engineer set up a test in your plant—on one machine, or on your whole line.

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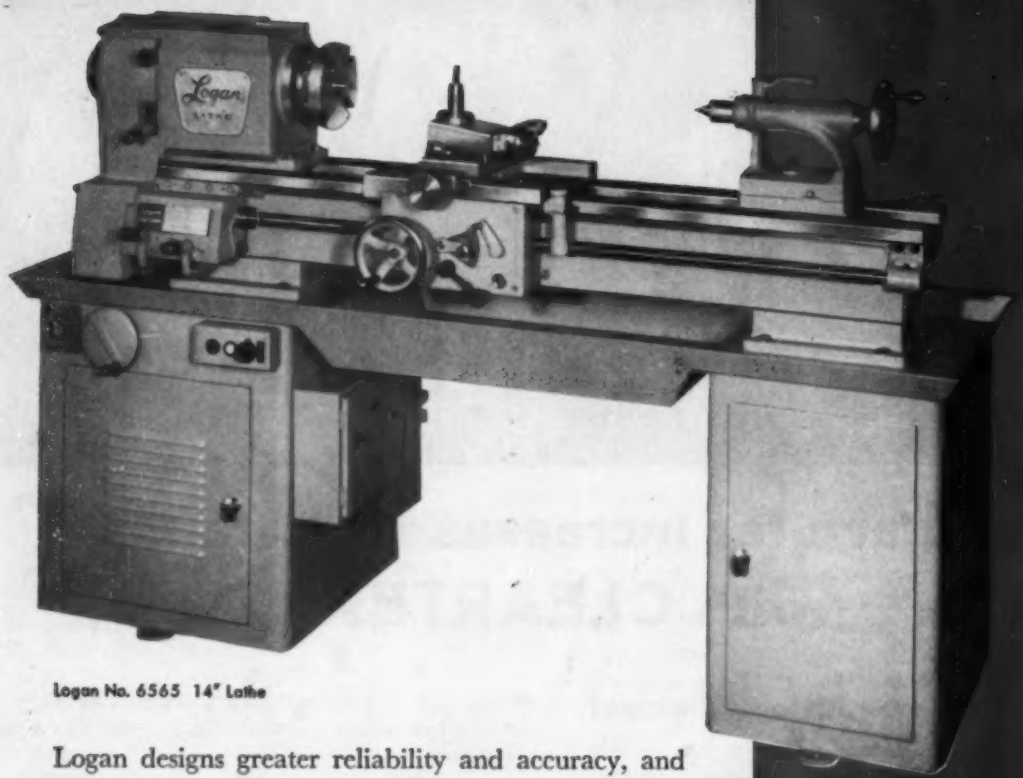
Logan 14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-quality features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
- A variable-speed drive lets you change speed while work is turning—without shifting belts
- A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.

There are many more reasons why this and other Logan Lathes have a greater capacity. The specifications tell the story. Write for literature and complete information.

- Spindle speeds to 2000 rpm.
- 1½" Levermatic collet chuck capacity
- 14⅜" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

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Before It Is Too Late

Never has the physical condition of our nation's industrial plant been worse than it is today.

What's more, the machinery is getting older, more obsolete, less efficient and more costly to operate year by year. And unfortunately not enough money is being spent on new equipment to reverse this disastrous trend.

This neglect . . .

of our industrial machinery is one of the reasons that we are in a recession.

Nothing is more important to restore our economy to full vigor than to remedy this dangerous situation by encouraging investment in new equipment. Such investment has sadly lagged for too long.

The new administration in Washington fortunately is alert to the problem. With its New Frontiers approach, it already has brought into prominence a new term and a new plan that should help to solve the problem promptly. I refer to the "investment credit" plan.

This plan specifies that a manufacturer can deduct from his final tax bill a percentage of the amount by which his investment in new plant and equipment exceeds his depreciation deduction during the year.

One of the great merits . . .

of this plan is simplicity. The plan also is highly flexible, because the percentage of allowable credit can be raised or lowered or even removed as conditions warrant. More than that, it does not require any change in tax accounting of depreciable assets already on a manufacturer's books.

Another simple way to stimulate capital spending is to increase sharply the tax depreciation allowable the first year. Other industrial nations have resorted to this device with eminent success. The United Kingdom and Japan have permitted writeoffs of more than 50% the first year. In Italy and Sweden it is over 30%. Yet in this country it is a miserly 13%.

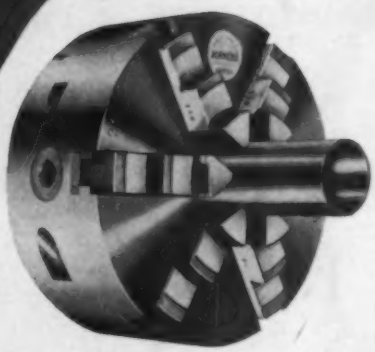
It would be idle to pretend that either the "investment credit" plan or a big stepup in the initial writeoff is the ideal way in which to induce industry to expand and modernize its plants on a continuing basis. But it would be a constructive and stimulating start in the right direction.

Before our industrial plant . . .

deteriorates further to a shockingly poor level, there just is not time for long, exhaustive studies of depreciation. Congress therefore should enact into law at the earliest practical time either the "investment credit" plan or a sharp increase in allowable first-year depreciation rates.

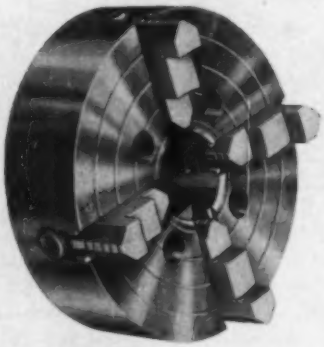
But the government should not stop there. It should begin work immediately on a sweeping revision of the rules and regulations governing depreciation of capital goods. For the long-term pull, such revision is a sound and permanent solution of the problem of keeping our industrial plant modern by encouraging the use of new technological advancements now available.

Burnham Finney EDITOR



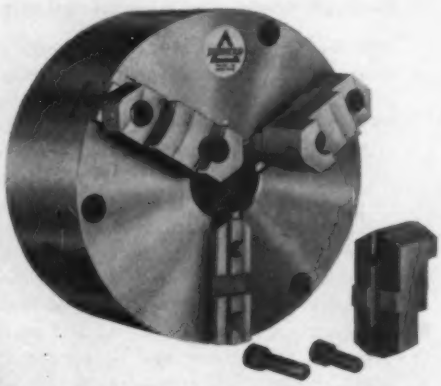
BURNERD GRIPTRU CHUCKS

3- and 6-Jaw, 4" to 12" Diameter
Chucks work to within .0002" *at scroll chuck speed.*



BURNERD INDEPENDENT CHUCKS

4-Jaw, 3¼" to 28" Diameter



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A 6" Universal chuck costs only $78.50—a 12", only $180.00

A 6" 3-jaw GRIPTRU—which chucks duplicate parts to within .0002"—costs only $96.00

14" four-jaw Independent is $136.00!

Burnerd chucks are available for direct mounting to long taper or D-1 cam-lock spindles, or for backplate mounting.

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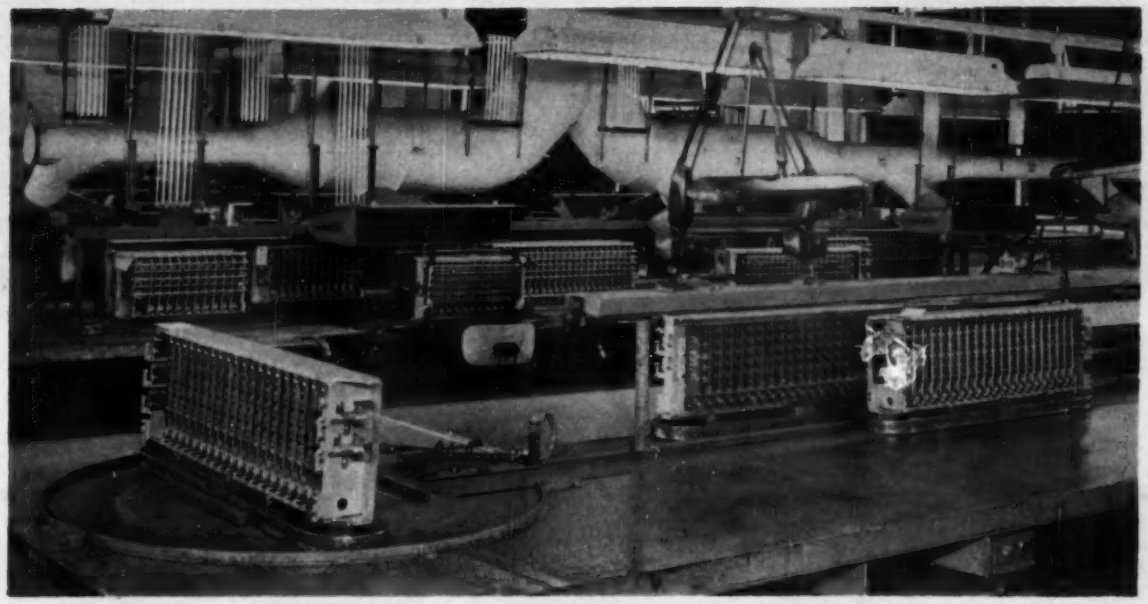


Turntable built into end of conveyorized workbench automatically reverses loaded work carrier and feeds it to conveyor belt on other side of bench. Limit switches control entire table cycle

Turntables do the trick

Accordion-pleated assembly line

Conveyor line that folds back on itself in hairpin turns is Western Electric's answer to a limited space problem

By George D Lea, manufacturing engineer
Hawthorne Works, Western Electric Co, Chicago

From a materials handling viewpoint, a nice straight-line conveyor with all assembly operations lined up successively along it is just about ideal.

But such an arrangement, even when it can be achieved in a busy plant, has its drawbacks. It is difficult to supervise for one thing, and loading and unloading stations are generally too far apart.

Frequently, such a line is split in two and turned back upon itself, with two lines of benches placed back-to-back and connected at the turn with a crossover conveyor This arrangement does bring unloading and loading closer together, but it too is hard to supervise.

Straight and double-back

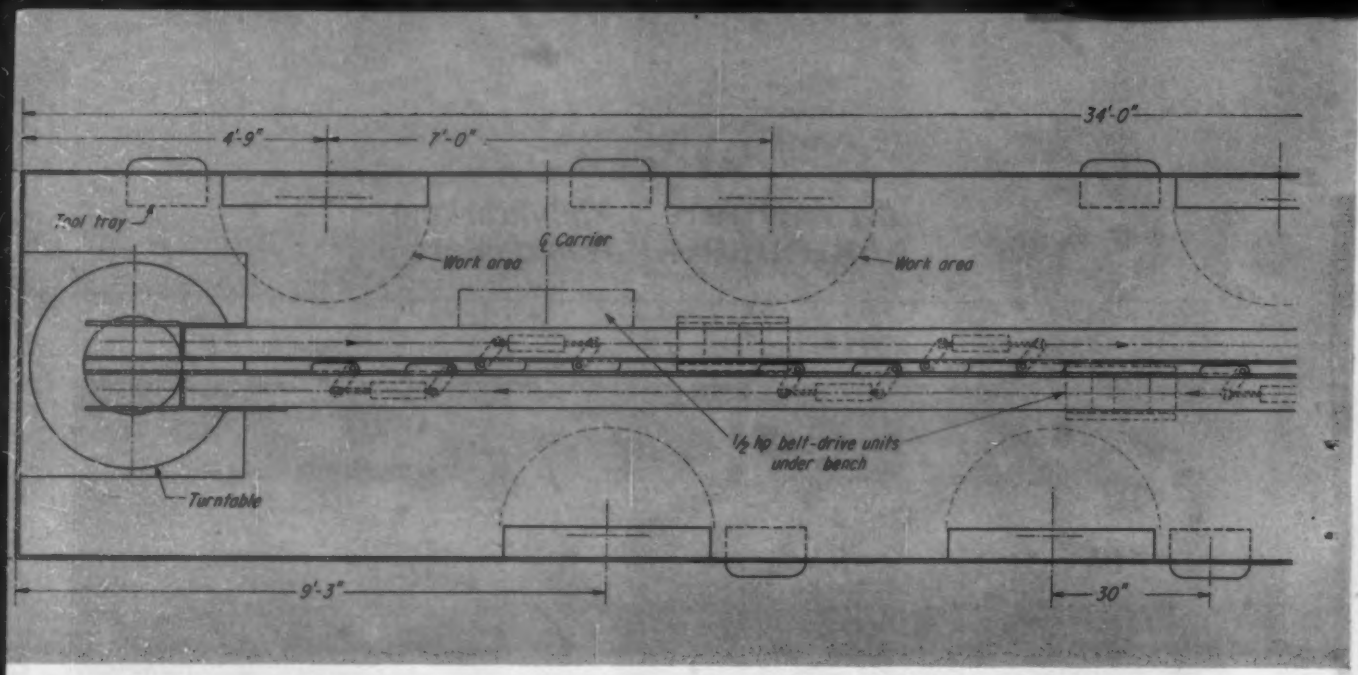
Western Electric's Hawthorne Works, Chicago, has come up with an arrangement that is a combination of straight-line and doubled-back assembly lines—in effect, a straight conveyor line that folds back upon itself in a series of accordion pleats. Each pleat is a short U-shaped line with a turntable at the crossover end.

This arrangement also overcomes limitations imposed by the shape of the available work area.

Boat-type fixtures

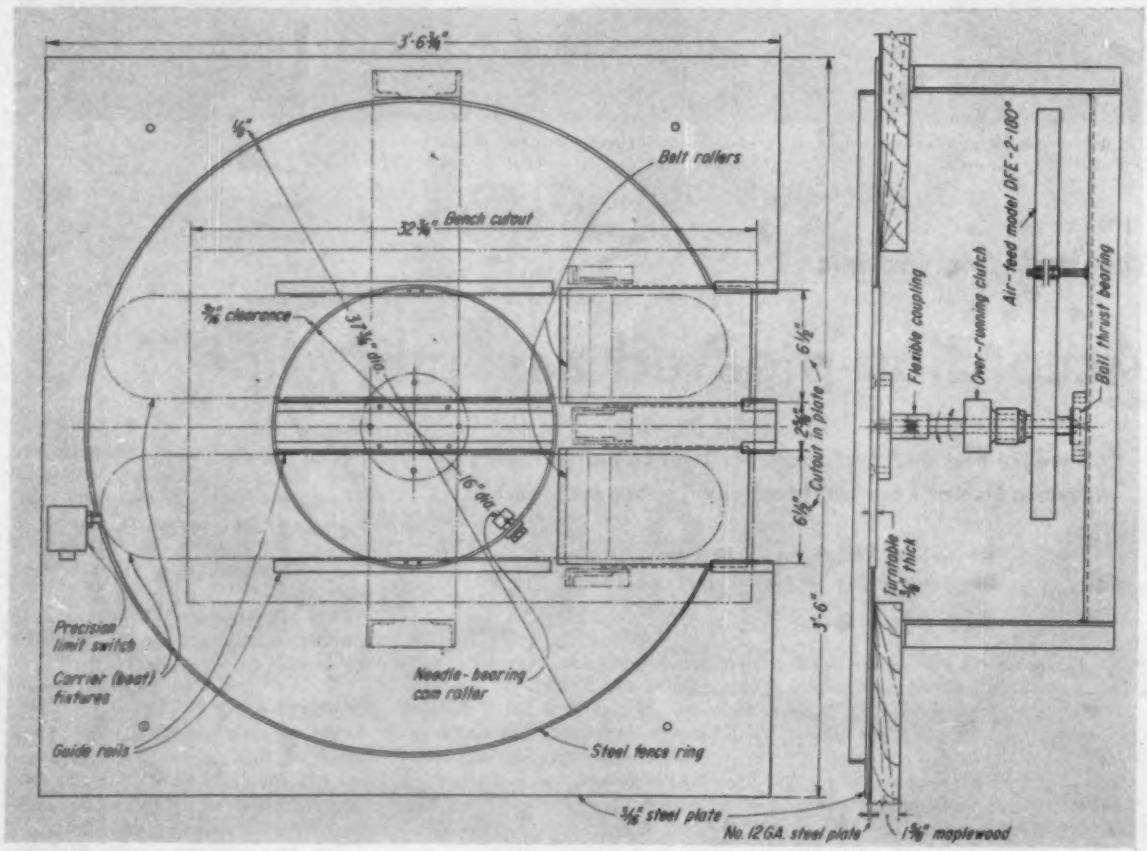
Crossbar switch assemblies produced on this line at Western Electric are mounted on 6-in.-wide, 36-long cast magnesium carriers—boat-type fixtures with rounded ends.

The line consists of ten 34-foot-long, 6-foot-wide workbenches, each 36 inches high, extending alternately to the right and left from a transfer

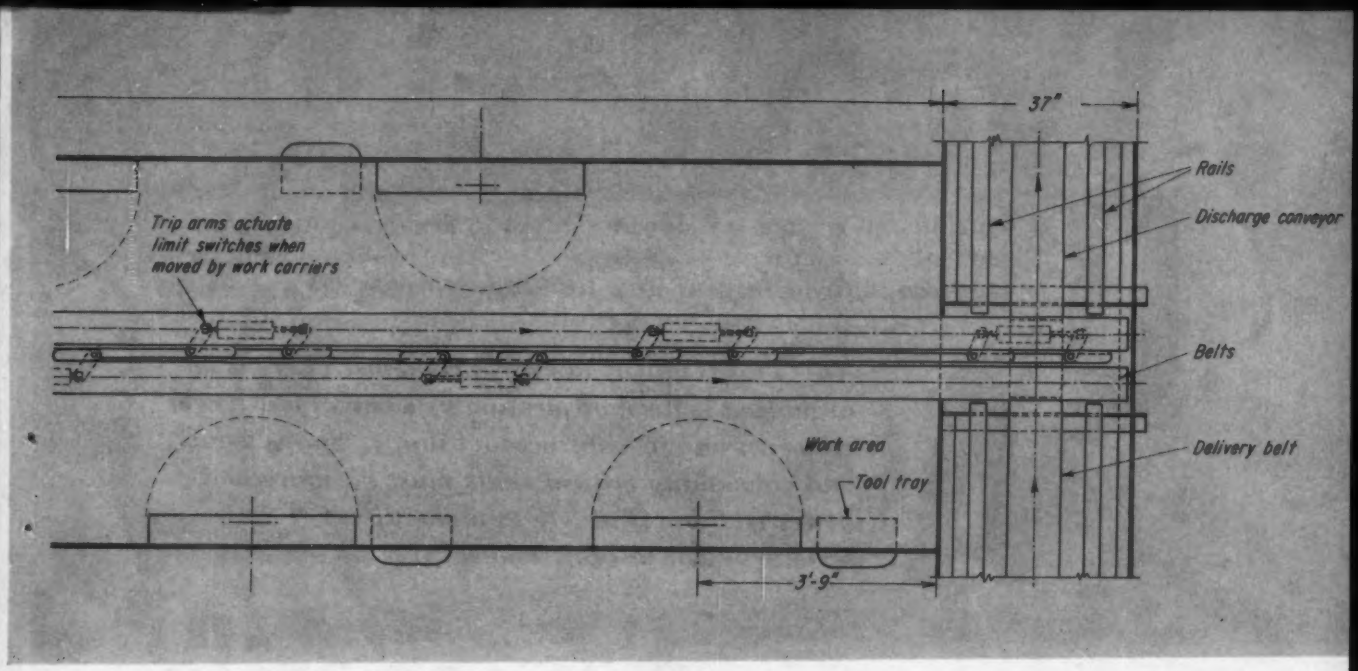


Top of 6 x 34-ft workbench is faced with sheet of 12-gage steel, and has tool trays located conveniently beside each work station. At one end, work carriers automatically are delivered to and removed from 6-wide belts by 10-in. wide belts of transfer conveyor tables—at other end turntable is inset into center of bench to reverse movement of work

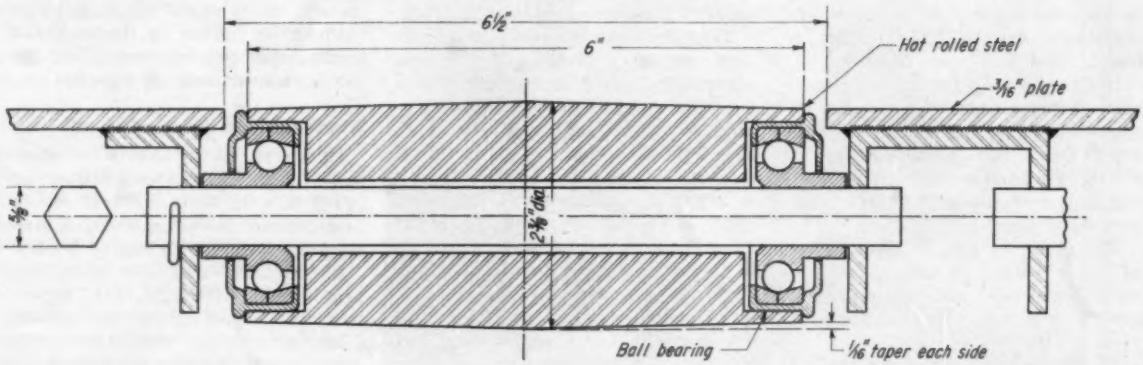
THE TURNTABLE ASSEMBLY



Face of turntable in conveyorized bench for assembly, adjustment and inspection of crossbar switches is 12-in. dia, ⅛-in. thick steel disk supported by spindle assembly and four cam rollers. It has four parallel guide rails which keep work carriers aligned with conveyor belts. Steel fence prevents movement of carriers while turntable is rotated 180°



DETAIL OF BELT ROLLER AND BRACKET ASSEMBLY



line. This transfer line is made up of a series of belt conveyor tables so arranged as to move the work carriers successively from bench to bench automatically.

Extending longitudinally along the center of each bench are two 6-inch-wide, 5/32-inch-thick conveyor belts, moving in opposite directions from and to the transfer conveyor line. Belt speed of each is 6 feet per minute.

Choice of arrangements

Belts on individual benches can be arranged so as to move continuously or intermittently. Movement takes place only when each operator along both sides of a bench has completed his job, has returned the work carrier to the belt, and has operated a pushbutton which signals that his station is cleared.

Key to the success of this compact line is an automatic turntable at the outer end of each bench. These turntables reverse the direction of travel of each work carrier successively by moving it from the discharge end of the incoming conveyor belt and then to the loading end of the return belt.

The turntables operate in one direction only, are actuated by Bellows DFE-2-180° Hydro-Check pneumatic drill press feeds connected to turntable spindles thrcugh over-running clutches which operate in only one direction.

Each turntable is actuated when an incoming carrier closes a precision Microswitch. It cannot be reoperated at the end of a cycle until the outgoing carrier clears contact levers that open another Microswitch as the carrier turns into the discharge position. The turntable cannot recycle until it has been unloaded.

Applies to other sizes

This turntable design can easily be applied to belt conveyor benches that use work carriers of other sizes, simply by redimensioning key dimensions. Too, Western Electric claims the turntables make assembly line arrangement very flexible to meet a variety of handling and production problems. •

Q *Are enough firms in your area training apprentices?*

A *No! This is one of our key problems. There is an organized pattern of pirating by some of our larger concerns and by contract tool shops. Shops using and consuming critical skills must do more and better training if we are to make up a serious deficit in craftsmanship!*

A TOOLROOM FOREMAN

"Give us the men and we'll give you the pieces." As the shortage of skilled metalworkers becomes increasingly serious, this refrain is heard more and more often.

It has, in fact, become the toolroom foreman's almost automatic response in discussing costs and delivery dates. By "men" he means skilled workers, and nobody is handing such men on a gift platter to anyone these days.

The plain, hard truth is that short of labor piracy, which is self-destructive at best, a shop must recruit and train its own people in the skills it so vitally needs.

It is no exaggeration to say that the ultimate success or failure of a shop depends upon how well this job is done and in large measure this responsibility falls upon first line supervision, the toolroom foreman.

How *does* a foreman go about training men? What are the problems? Here are the answers as given by John Bish, foreman of the Prototype Department, Chandler Evans Corp, Hartford, Conn, who is responsible for translating engineers' blueprints into complex aircraft carburetors.

What kind of men do you need to do prototype work?

As a toolroom foreman, I have to get my jobs done by using machine tools engineered to do precision work. The company has given me some fine equipment, but even more important than these tools is the knowledge and skill of the men who must do the work.

Take, for example, one of the castings my firm makes. It requires about 500 different operations. When I assign this job to a toolroom machinist, I hand him a blueprint 15 feet long and about six feet wide. I expect him to:

- Study and understand the print so that he knows the end product intended by the designer.
- Detect and bring to my attention errors in the print.
- Establish a logical starting point for the job, then a sequence of operations that will move the job along logically and economically.
- Hold these tolerances: squareness 0.0002 in., concentricity on seven or eight diameters to 0.0002 in., and other critical diameters to as little as 0.0001 in.
- Work to these tolerances and extremely fine surface finishes on such metals of different cutting characteristics as aluminum, magnesium, brass, tool steel, nitrided and nickel-chrome steels, as well as plastics.
- Approach the challenge of a job with a desire to meet and overcome its inherent difficulties.

We are in a dynamic business—changes occur daily. It takes more than routine precision to do the work, because we just don't get routine jobs. Instead, we get problems.

A man in this business must be willing to think, able to think, and have the courage and ability to make good decisions. If we don't have a man who can do this, the job ends up with me or one of the supervisors holding the worker by the hand and leading him step by step. Then the job bogs down and costs go up.

Where do you get good men?

Of course, we try to hire first-class mechanics, but such men are almost impossible to find. Even if we do hire one occasionally, we still must train his skills to our line of work.

We couldn't man our expanding prototype department with "hires," so several years ago we worked out a learner program with the training department. But this program failed to attract young men with the skills and knowledge needed for our work. True, we did get some good men, but the percentage wasn't high enough. Some of the men quit because the work was over their heads: Others transferred to departments where skill and responsibilities weren't so demanding.

About two years ago, we decided that apprenticeship was the answer—but not just a "paper" program. We knew we really had to get into the education business to build skills as well as products. We knew, too, from previous experience that our objectives would be reached only through careful selection of apprentices, and by setting up a demanding program of work experience and instruction—a program that would challenge and stimulate those who wanted to, and could, learn the

What can be done at the immediate supervisory level to overcome that most critical of today's problems—a growing shortage of skilled metalworkers? Perhaps more than anyone else in the shop, a toolroom foreman must live with the problem from day to day. Here, a really "savvy" foreman is interviewed on what he and his company are doing to build a skilled workforce

By I Harry Hyman, State Supervisor, U S Department of Labor,
Bureau of Apprenticeship and Training, Hartford, Conn
From an interview with John Bish, toolroom foreman, Chandler Evans Corp, Hartford

TALKS TRAINING

trade. At the same time, it would have to discourage and eliminate those who would never be more than also-rans.

How do you select an apprentice capable of becoming a craftsman?

We have tried several methods, and the present one works well. Our personnel department sees a large number of young men who come in for jobs. The likely ones are told about our apprenticeship program. If interested, an applicant talks with our supervisor of apprentices.

Incidentally, our basic requirements for apprenticeship include: U S citizenship, age from 18 to 22, a high school diploma with average grades or better, especially in mathematics; algebra through quadratics, plane geometry, trigonometry; a year of physics or chemistry; and a good mechanical aptitude score.

The apprentice supervisor tells a qualified candidate about the demands our educational and training program will make on him, about the wages he will receive over the period of apprenticeship (usually less than on a production job), and about the long-range benefits that accrue to the craftsman.

One point is stressed over and over: *Mastery of a trade requires extra effort on and off the job—over and above that required of a production worker.*

Next, the toolroom foreman looks over the applicant and the results of his tests, then takes him into the shop to show him equipment and the work being done in the department. At the same time, the toolroom foreman tries to determine just how much interest the applicant has in becoming a toolroom machinist.

Toolroom foreman John Bish (right) inducts Stephen Klescz into the art of building a highly complex aircraft carburetor. The average shopworker's ability to make this carburetor is just about on a par with his aptitude for nuclear physics

He bases this on an area of mechanical interest which the applicant may have revealed in his interview. For example, if the applicant is interested in automobiles, he may be asked such questions as: Have you ever changed spark plugs? Have you ever ground valves? What is a timing gear? Crankshaft? Camshaft?

The foreman also checks for attitude, appearance, neatness, willingness, how he gets along with his friends and family, his teachers and classmates, whether he is willing to work nights, and the like.

We give a lot of time and effort to selection, because our experience

shows that first-step selection can make or break a program.

What is your training procedure?

We delegate responsibility for an apprentice's instruction and progress to a leadman or group leader—also known as a supervisor. But the foreman doesn't just delegate this responsibility and forget about it. The leadman is responsible to the foreman for the apprentice's progress, for the quality and breadth of his instruction, for stimulating his interest, and for giving him job problems that will make him think. Apprentice training must emphasize challenge, and must in no case fall into routine.

We require that our leadmen not only use teaching methods that show an apprentice *how* to do an operation, but methods which show the *why* of a particular technique.

Leadmen in our Prototype Department must provide a "craftsman image" for the apprentice to emulate. They must see to it that the apprentice absorbs proper work habits, job attitude safety practices and standards of performance by instruction and association.

We can do this because all of our leadmen are fine mechanics, especially selected for their ability to communicate ideas. But I think the thing that ties it all together is the apprentice's knowledge that the leadman and the foreman really care about his progress.

Do you have a basic program of job experiences for the apprentice?

Yes. Our apprentices start with four or five weeks in the tool crib learning what tools are called and what they are for. The tool crib supervisor also makes sure that the apprentice learns to operate cutoff saws and the bandsaw.

After that, the supervisor sends him to the tool grinding department, where he is taught how to sharpen cutters, reamers, turning tools, drills, taps, and so on. When the apprentice leaves the tool grinding department he is usually assigned to one of the toolroom areas for 10 to 12 weeks.

We have five such areas in our toolroom: turret and turning, prototype and experimental, toolmaking, grinding, and jig boring. The apprentice gets a chance to work on all types of jobs and equipment, and under several supervisors.

In addition to toolroom experience, the apprentice works in these areas:

- Tool tryout, where he sets up tools, jigs and fixtures for use in volume production.
- Production machining, where the apprentice operates such machines as broaches, gear shapers, borers, profiler and lapping machine, which are not normally used in toolrooms.
- Heat treating.
- Machine repair, with stress on preventive maintenance.

How do you keep track of an apprentice's progress?

Our apprentices keep notebooks in which they record the types of jobs they work on, the machines used, problems encountered and the principles and methods used in solving the problems.

We found at first that apprentices were reluctant to use notebooks and often did not include the most important information. They needed to be taught how to use this learning tool by the supervisors. Now, the supervisor goes over the notebooks with the apprentice at least twice a week. At the end of each month the books are turned in to the foreman, who checks the apprentice's progress with them.

Every three months the apprentice is given an official rating sheet, which he partially fills in and then turns over to the supervisor for completion. The foreman checks and signs the rating sheet and gives it to the supervisor of apprentices, who keeps it as part of the apprentice's record. In addition to the notebooks, the apprentice keeps a record book showing the number of hours on different machines and areas.

What about classroom instruction?

We operate our own classroom program for shop mathematics, theory of cutting tools, blueprint reading, job methods, metallurgy, applied mechanics and safety.

This subject coverage, while similar to that for most toolroom machinist apprentice courses, differs somewhat from the usual technical school program. For example, we use our own prints and castings in our advanced blueprint reading class. This makes it possible for our instructor to work with a real job, using our company's engineering symbols and dimensioning system, and from this job to develop the information contained in the print.

He can, for example, show how the different views apply to the casting, determine a method for doing the job, and explain various ways of meeting problems that arise.

We find that this makes the learning process come alive—simply because the apprentices are working on the types of jobs they will ultimately be called upon to do. It also helps the supervisor on the job, because the apprentice gets a better grasp of specific job problems that have to be met on the shop floor.

In addition to classroom work, we require that each apprentice write an every-other-week report on some basic metalworking topic, such as threading, centerless grinding, surface roughness, single-point tools, multiple-tooth cutters, drilling, milling, speeds and feeds, and the like.

Incidentally, our apprentices attend classes six hours a week on company time.

Do you think that apprentice training adds materially to the cost of operating your department?

Certainly—you can't get something for nothing. Apprentice training requires the time and assistance of the foreman, supervisors and other craftsmen to bring a man to the point where he can stand on his own. Until that time, the apprentice adds to our overhead, scrap rate, and job time.

But with proper selection and training, and a conscientious effort on the part of the apprentice himself, these minuses are changed to pluses in a few years' time.

With the country short of skills, this investment in young men is one of the unavoidable costs of doing prototype work.

Do you think that tape-controlled machines will reduce the need for toolroom machinists?

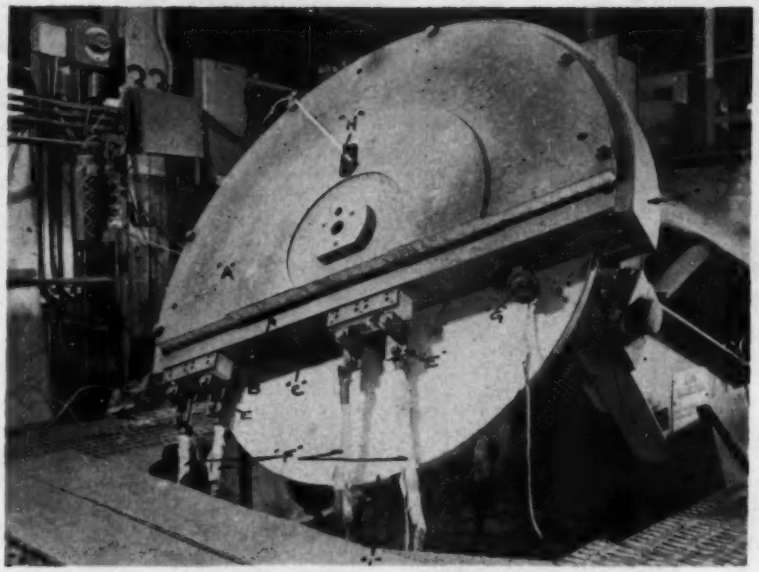
As far as I can see, no. We will still need human skill in prototype work. Under present conditions, prototype work and really complicated short-run jobs cannot economically be put on tape. Neither engineers nor machines are adequate substitutes for craftsmen.

If management invests in engineering and machines to the exclusion of educating and training craftsmen, not only will the competitive position of that particular company be hurt, but the overall capacity of the metalworking industry to meet the technological challenge of The Sixties will be impaired.

Templets or prototypes for production *must* be made by craftsmen if even production runs adaptable to tape-controlled machines are to have a minimum of errors. •

Hot plate beats preheat problem

Shop-made device distributes heat uniformly, holds close temperature range, and helps make quality welds between stainless and carbon steel



Electric preheat plate is powered by welding generators. Precise temperature control and uniform heat permit close dimensional accuracy in product

This 60-in. hot plate is a little large for warming up a pot of coffee, but it does a very precise job on steam-turbine diaphragms. The job is to preheat the diaphragms to a temperature of 600 F, with a tolerance of only ±25 F, and to hold that temperature throughout a welding operation that takes about 24 hours.

In welding up the diaphragm halves, Allis-Chalmers Manufacturing Co (Milwaukee) faced a prcblem in welding the stainless steel vanes to carbon- or low-alloy-steel webs and bands. Further, the welds had to be crack-free under X-ray and magnetic particle inspection and under a severe bend test.

Experimental work indicated that welds of this class could be made by holding the proper preheat temperature—600 ±25 F. But conventional welding hot plates were not practical for the job, so the company designed and built its own and hitched it to a welding power source with low voltage and high amperage.

As described by W A Schumbacker of Allis-Chalmers in a paper presented at the Plant Maintenance & Engineering Show, the plate has a diameter of 60 in. and an overall thickness of 5½ in. Approximately semicircular, it extends a little more than half a circle to allow room for a center so it can be mounted on the table of a positioner.

Coil arrangement

The heating coils inside the body consist of 28 Nichrome wires, 0.1285 in. in dia and all cut to the same length. These are arranged as closely as possible to the top plate and are wound in a pattern to heat the entire top surface uniformly. Over the entire length of each wire are fish-spine beads (0.400 in. OD) to provide insulation. In addition, the space around the wires and between the wires and the bottom plate is filled with diatomaceous silica.

Operating temperatures are controlled with the help of two thermocouples, one monitoring the temperature of the workpiece, and the other acting as a safety, to keep the heating coils from going over 1000 F.

Thermocouple location

The weldment thermocouple "H" is clamped to the weldment at a point far enough removed from the weld to register the average temperature of the weldment. This thermocouple is attached to a control that cuts in when the temperature of the weldment falls to 575 F and cuts out when it reaches 625 F.

The heating-coil thermocouple "G" is installed at approximately the middle of the heating coil and is connected to a control that cuts in at 800 F and cuts out at 1000 F. Normally therefore, the temperature control for the weldment can draw current when it needs it.

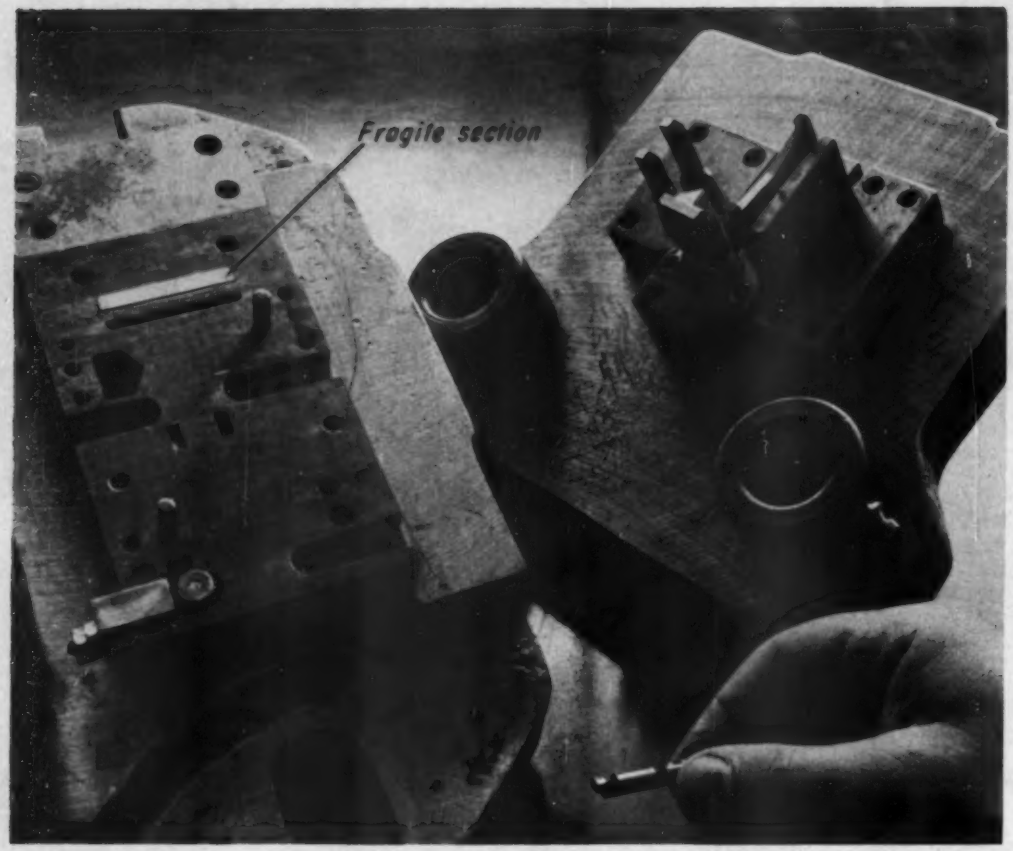
However, in times of exceptional heat demand, the heating-coil thermocouple and control will keep the coils from going to temperatures where the Nichrome wires become brittle and the life of the heating coils is shortened. Below 1000 F, the hot plate lasts almost indefinitely.

Before the start of any welding operations, the hot plate is covered with asbestos blankets and heated very slowly to 625 F with current from two 750-amp, parallel-connected welding generators. A low input current for the initial heating lets the hot plate soak well and prevents warping. Once it has been brought to operating temperature and is straight, the generators are set at 15 to 20 v and 450 to 500 amp.

The weldment, too, is preheated, but this is done in a furnace. After it has reached 625 F, it is transferred to the hot plate and anchored securely. Then the entire weldment and the top of the hot plate are covered with several layers of asbestos blankets. If the temperature is 600 F, welding can start.

The operator uncovers only as much as necessary of the area to be welded. This holds the preheat and also makes the job more comfortable for the operators. During inactive periods the work is re-covered with the asbestos blankets. The temperature controls will keep it at the required temperature.

Results with the equipment have been good. As Schumbacker says, "For these reasons—better weldment quality, more desirable working environment, and lower cost of equipment—the electric hot plate has more than satisfied our requirements . . ." •



Die for spring clip incorporates interchangeable punch and die sections, which are now made of Ferro-Tic C steel-bonded carbide. Fragile section frequently broke when made of tool steel

Steel-bonded carbide dies SAVE!

Die costs have been cut substantially three ways—downtime, grinding, and replacement—by this relatively new material. Look at the record

By Richard L Post, manager, Tools, Dies and Equipment,
Edwin L Wiegand Co, Pittsburgh

A switch to machinable carbide dies at Edwin L Wiegand's Pittsburgh plant has effected such remarkable cost-cutting that other Wiegand toolrooms have now been instructed to use steel-bonded carbides wherever practicable.

Not only that, the carbide dies can be machined almost as easily as tool steel, can be hardened in the shop, and are ready for the press within a matter of hours.

For the record it can be said that:

- Total production out of the new dies is at least 25 times that of conventional tool steel.
- Runs between dressings are at least three to four times longer.
- Rework expenses are less—only a few mils need be ground off.
- Downtime is drastically reduced.

Steel-bonded carbides are especially useful for heavy-wear applications, such as progressive stamping dies, wear plates, guide rollers, and reinforcing inserts for conventional tool steel dies.

One material used successfully by Wiegand is "Ferro-Tic C,"* a sintered composite of tool steel and titanium carbide, produced by powder metallurgy techniques at Chromalloy Corp's Sintercast Division, Yonkers, N Y.

In the annealed state this material can be sawed, drilled, turned, milled, reamed, or threaded—then hardened to Rh C 73. After hardening, the carbide can be ground with silicon-carbide wheels, or lapped with silicon carbide, boron carbide, or diamond compounds—to hold close tolerances or to produce a mirror finish.

*First application story on this material discussed machining, heat treating and press tool applications at Fred Goat Co, Brooklyn, N Y (AM/MM—Oct 5 '59, p87).

Because of these characteristics, Wiegand can make its own tools and dies—no matter how complex in contour—without expensive diamond grinding wheels and special machinery. And it can be done without the company having to wait several weeks for an outside supplier.

60 million clips

Wiegand make stainless-steel clips by the millions in three-station progressive dies. Each die has six to eight interchangeable punch and die sections. By relocating or replacing sections, four types of clips, differing only slightly in slot location, are produced.

The original dies were made from high-carbon, high-chrome tool steel. Over a four-year period, Wiegand made 7-million clips, and had to replace each of five sections twice. Regrinding was required after 150,000 pieces.

After changing to the machinable carbide, more than 20-million parts have been made without replacement of sections. Regrinding is now required at 500,000 pieces.

Total production of these dies sections is expected to be about 60-million clips. Yet this is not an easy job. The spring-temper stainless is generally conceded to be a difficult material to stamp and form. Add to this the need for holding close tolerances: ± 0.002 in. for overall size and contour, as well as size and location of the slots.

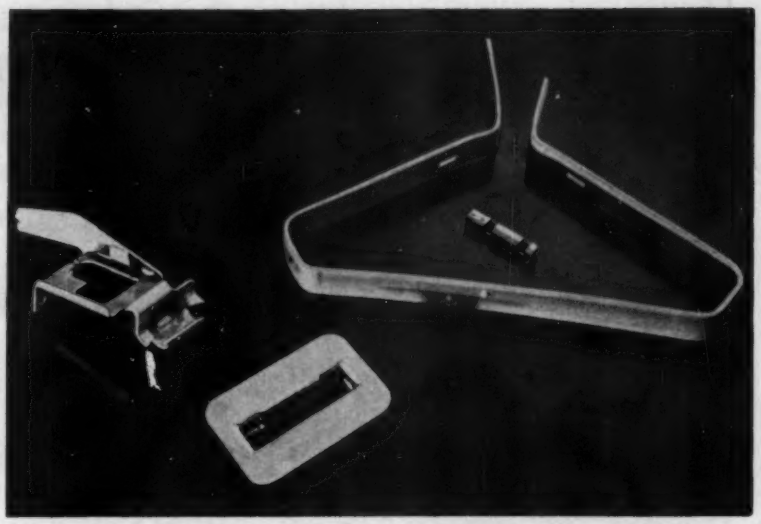
Less scoring

Tool-steel dies scored deeply. At least 0.015 in. had to be ground off per dressing.

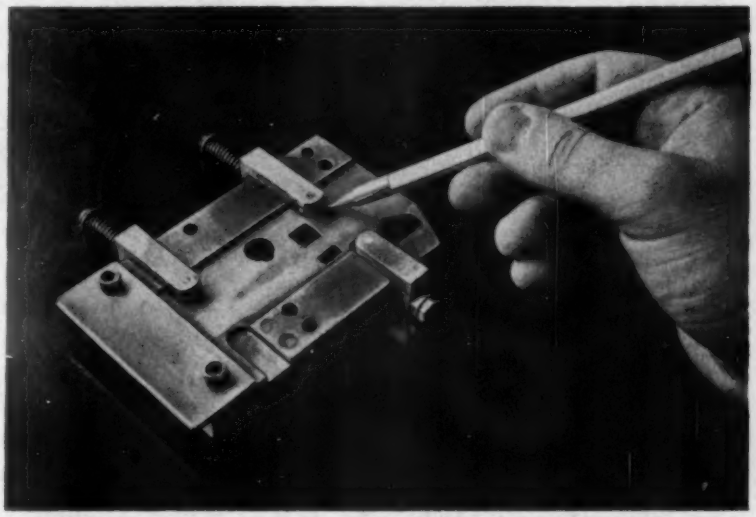
Wiegand's machinable carbide dies do not wear as much. Removal of a few thousandths reconditions the tools. Because land depth on die sections is ¼ in., the company expects to get 120 regrinds before minimum land depth of 0.010 in. is reached. For maximum service, punches are designed without relief.

Die costs

Made of Ferro-Tic C, the progressive die set used in stamping clips took about 123 hours to build, at a cost of $900. The same unit in tool steel would have cost only $600. This differential becomes insignificant when production capabilities are compared: 60-million clips from *one* carbide die-set, as against 7-million out of *three* steel dies. Choosing the carbide die is then in line with Wiegand's basic policy of spending up to $5000 to reduce the cost of a part by one cent.



Typical stampings are held to tolerances as low as ±0.002 in., even though spring-temper stainless is difficult to stamp and form



Guide rollers for stainless strip are now made of machinable carbide to increase wear life. Stainless strip slides rapidly past the rollers

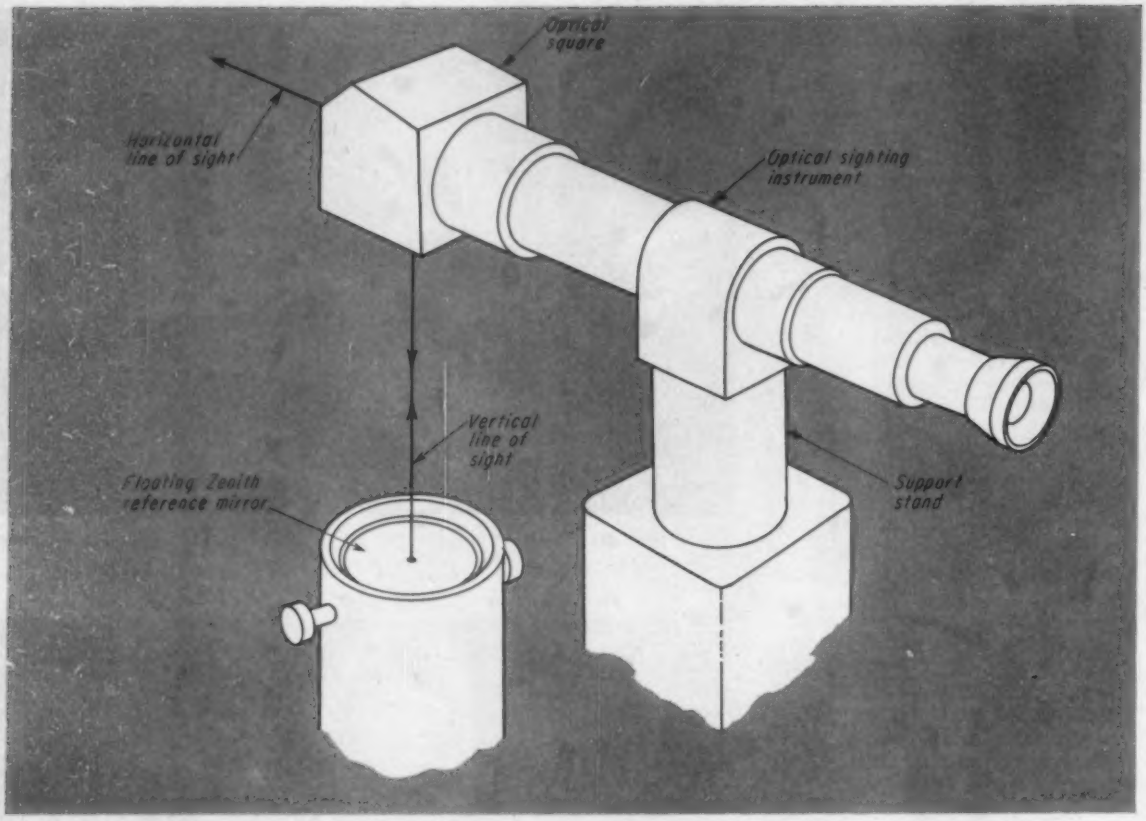
Resists breakage

Steel-bonded carbides have solved another problem. One section of the die set cuts off *and* bends the clip in a single operation. The tool steel formerly used in this thin die section was too brittle, and could not withstand repeated flexing. Breakage sometimes occurred after only 50 pieces.

Production had to be halted for about 11 hours while a new die section was prepared and installed. Since switching to the more flexible machinable carbide, this production delay has been eliminated.

Machinable carbide inserts also reinforce a forming die for bending support bars. Corners of this tool-steel die wore prematurely, necessitating shut-downs every 65,000 pieces for rework.

Now, however, carbide inserts have increased production runs to 200,000 pieces between dressings, in addition to prolonging total life of the die. The new assembly has already produced 1½ million pieces, and shows no sign of needing replacement. •



Any optical line-of-sight instrument can be leveled accurately with relation to a zenith line by viewing the AZRM zenith reference mirror through an optical square. It is "zeroed" when reflection coincides with projected hair line

Leveling the leveling instruments

It's all done with mirrors

When precision leveling of leveling instruments is too exacting for optical tilting levels the job is done with a zenith mirror floating in mercury

By Ben C Brosheer, associate editor

All instruments used in metalworking for checking alignment of machines must themselves be leveled accurately before they can do the job right. Into this category fall alignment telescopes, theodolites, autocollimators and several other types of precision line-of-sight optical instruments.

Ordinarily, most shops find that optical tilting levels (a combination of alignment telescope and precision bubble level) are adequate. Some of these units have a coincidence bubble viewing system—so that the two ends of the bubble can be observed and compared at the same time. Such levels can usually indicate a tilt of as little as 1 second of arc (a slope of about 0.0015 inches in 25 feet) consistently.

But this just isn't good enough for some setups. Not only that, the range of any optical tilting level is limited to that of the line-of-sight instrument built into it.

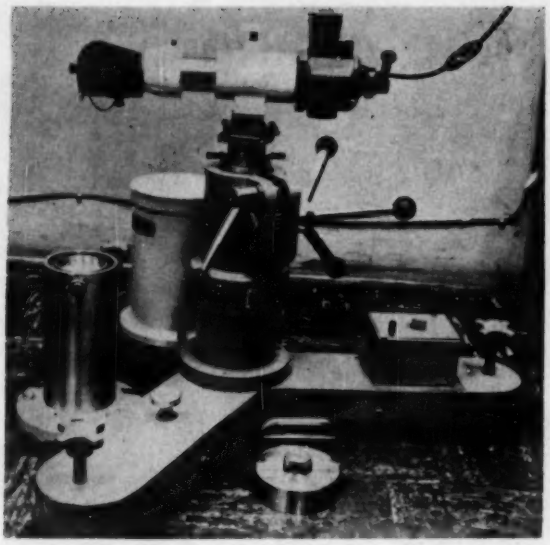
A more precise arrangement, one which can be used with any line-of-sight instrument on which an optical square can be mounted, involves use of a precision zenith reference mirror. One such was recently made for NASA's Marshall Space Flight Center at Huntsville, Ala, by Chicago's Acme Scientific Co.

This unit consists of an optically flat mirror established at 90° within less than 1 second of arc to an imaginary line passing through the zenith and earth's center of gravity.

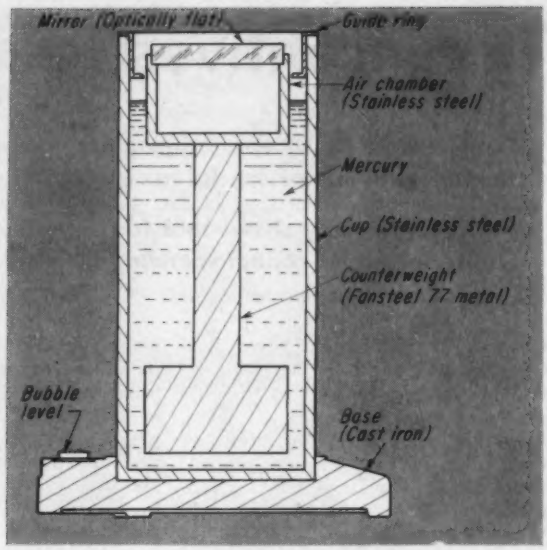
Floats in mercury

The mirror is mounted atop a plumb weight made of high-density (tungsten alloy) metal floated in a cup of mercury. This floating support is kept vertical by an air chamber bored into its upper section.

The floating medium (mercury) dampens movement of the mirror support—minimizing the time need-



Zenith reference mirror, floating in cup full of mercury, is positioned under optical square on end of alignment telescope on adjustable stand in typical setup for checking level of a large assembly. Mirror establishes a checking line between the zenith and earth's center of gravity



Mirror support, made up of high-density metal counterweight and air chamber cup, floats in large cup of mercury when base is leveled within 5°. This aligns mirror face at 90° ±1 sec of arc with zenith line. Mercury dampens external vibrations which might affect accuracy

ed for the mirror to settle into position after setup, and almost entirely eliminating the effect of ground vibrations on mirror position.

The mirror assembly floats in the mercury entirely free from the surrounding steel cup, and may be fully rotated about its vertical axis to various positions, without affecting the accuracy of the zenith line.

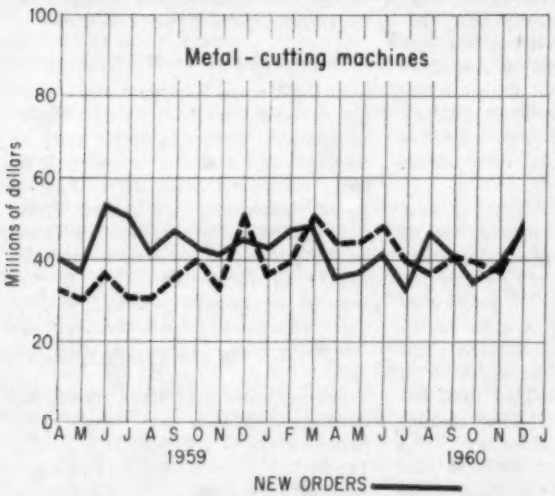
The assembly must be within 5° of level (as indicated by a bubble level mounted on the base) for the mirror unit to float within the cup.

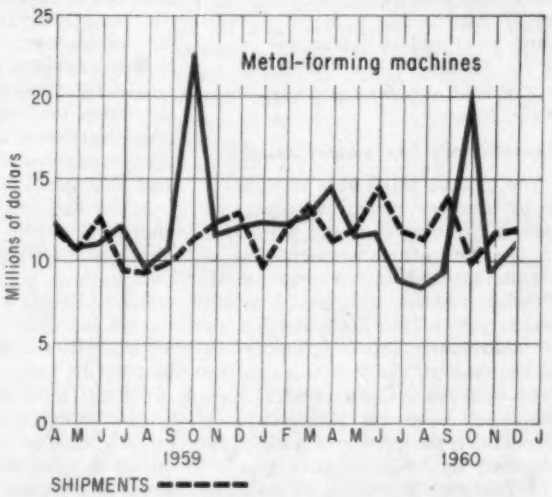
How accuracy is verified

Accuracy of any setup above one of these reference mirrors can be verified simply by taking readings in two positions, 180° apart.

In use, an optical square is mounted on the open end of the line-of-sight instrument (see photo and sketch) and is positioned above the uncapped mirror. The optical axis of the instrument is adjusted to "zero" when the image received from the reference mirror coincides with the hair lines that are projected onto the mirror. •

NMTBA Index of machine tool new orders and shipments





Net new orders for metal-cutting machine tools continued to rise in December, reaching $47,600,000, according to preliminary figures from the National Machine Tool Builders' Association. Orders in November were $39,750,000. Shipments in December reached $48,600,000 up from $36,900,000 in November. Orders for forming machines ran to $11,650,000 in December, up from $10,200,000 in November. Shipments rose to $11,850,000, up from $11,650,000 in November.

Tax incentives to spur spending

Congress likely to encourage plant modernization by faster write-offs or special tax credits.

Treasury study shows that faster write-offs would cause increased capital spending by industry.

Chances are the best in years that Congress will enact in 1961 legislation providing some sort of tax incentive to manufacturers to invest in capital equipment. The incentive may be in the form of more liberal depreciation. But it might instead consist of tax credits that achieve the same purpose.

An "investment credit" is the most talked about method of providing a tax stimulus to capital spending. Its champion is Harvard Law School Professor Stanley Surrey, who headed President Kennedy's taxation task force that reported recently in favor of the plan.

Here is how the "investment credit" idea would work: A company would deduct from its final tax bill, not from its taxable income, a percentage of the amount by which its investment in new plant and equipment exceeded its depreciation deduction during the year. Merits of the plan are said to be 1) a spur to expansion as well as replacement; 2) flexibility, because the percentage of allowable credit can be raised or lowered or even removed, depending on how much the government wants to stimulate capital spending; 3) no change in tax accounting of depreciable property already on a firm's books.

Discretionary tax power sought

The idea of being able to turn on or off the tax incentive spigot for capital spending is being promoted by the White House, which is seeking certain discretionary tax power. Flexibility of tax rates, which would result from such discretionary power, is advocated in the recent report on the state of the U S economy by Prof Paul Samuelson of MIT, who captained a special Kennedy task force. Such power would have to be obtained by Congressional grant.

A financial bait to small business is dangled by a bill introduced in the Senate by John Sparkman, Alabama Democrat (S 2). The bill specifies that a company may take a maximum tax deduction of 20% of its net income, or $30,000, whichever is the smaller, by reinvesting part of its income immediately in depreciable assets or inventory. This measure has the support of both Democrats and Republicans on the Senate Small Business Committee. An identical bill (HR 2) has been introduced in the House by a bipartisan group headed by Rep Frank Ikard, Texas Democrat.

Liberalized depreciation

Despite other methods of stimulating capital investments, faster depreciation rates still draw prime attention. Mr Eisenhower, in his final budget message, advocated "more liberal and flexible depreciation (that) would encourage business expenditures for modernization and greater efficiency, thus helping to foster long-range economic growth."

65% of the large firms and 59% of the small replying to the Treasury depreciation survey said that liberalized depreciation would materially influence their investment decisions so as to increase their capital spending, the preliminary report shows. Treasury hopes that the report may be a guide to consideration of possible revisions in the depreciation law. About 3500 companies contributed their views, 2000 of the respondents being large firms and 1500 small.

About 70% of the big companies and 57% of the small use one or more of the liberalized depreciation methods authorized by the Internal Revenue Code of 1954, with the double declining balance method being the most popular. Around 22% of the larger firms and 37% of the small have elected to take the allowable first-year writeoff of 20% up to $10,000 of capital outlay ($20,000 on a joint return) for new and used equipment. More than three out of five of all respondents consider current depreciation allowances unsatisfactory because of the excessively long useful lives required by Internal Revenue. About 70% also feel that the change in price levels is a major cause of the present inadequacy.

Of the more than half of big companies favoring some form of depreciation adjustment to reflect increased price levels, about three-fourths believe that the best way is to allow the taxpayer to claim yearly depreciation based on original cost adjusted to changes in the price level. Sentiment for this action also was high among small companies. Around half of all firms surveyed expressed preference for a method permitting the taxpayer to choose his own depreciation method and the length of useful lives, consistently applied.

Faster writeoffs favored

If faster writeoffs were authorized along the lines they favor, a big majority of companies, both large and small, would be willing to conform book and tax depreciation accounting. Around 61% of large firms and 92% of small now take about the same depreciation for book as for tax purposes. They also would be willing to forego capital gain benefits on disposal of depreciable property to the extent of depreciation previously taken. Incidentally, 58% of the large companies and 42% of the small believe that future rates of obsolescence will change significantly (obviously being speeded up by technological developments).

Accelerated depreciation

In the United Kingdom and Japan the first-year writeoff on production equipment exceeds 50% and in Sweden and Italy it is more than 30%, compared with 13% here, a recent Machinery and Allied Products Institute study shows. The United Kingdom and Sweden permit recovery of more than 70% of the cost of equipment within the first three years, and Japan and Italy allow over 60%, compared with our 35%.

Foreign countries have found, according to MAPI, that "accelerated depreciation is a potent stimulus to productive investment," and hence to economic progress. The stimulus is two-fold: 1) liberalized depreciation augments the supply of capital funds, and 2) at the same time it increases the incentive to invest such funds. •

Tape controlled drilling machine, including automatic beam feed, is heart of R C Mahon's new concept of structural fabrication. Beam is moved by chain-driven rolls against a carriage-stop which is numerically positioned for length. Feedback from carriage indicates called-out position and initiates hydraulic clamping action.

Revolution in structural fabrication

Drilling and reaming under numerical control, plus automated welding and painting, open new horizons to the construction industry. R C Mahon Co, Detroit, is finding startling savings resulting from the modernization program its management describes as the first significant improvement in working structural steel in sixty years.

Bridge reamers, the traditionally indispensable tools used to align incorrectly positioned holes, are virtually obsoleted by a single method improvement — numerical control. This innovation is saving 85% of the cost of manually drilling and reaming the many holes needed in structural beams and columns. Hole patterns to tolerances of ±0.005 in. instead of as much as ± ⅛ in. improve the entire assembly operation.

Conveyorized painting

Painting costs are halved by the mechanized paint line, which was the first step in Mahon's modernization program. Measuring 15-ft wide and 400-ft long, this line is the longest in the industry. It permits painting more than 1500 tons of heavy structural members per 8-hr shift.

Manual electrode welding equipment is being replaced with high-speed mechanized and automatic submerged-arc units. Mechanized units double the former welding speed. Larger tandem-arc automatic units are up to five times faster than the manual units. Better quality, consistent welds greatly reduce inspection and rework time—and cost.

During the next five years, Mahon management plans to replace with new machinery the balance of all production equipment in its Structural Steel Division. The many benefits expected from this program are focused on one essential: competition. It is necessary to compete with other materials—such as aluminum and prestressed concrete—and with other fabricators.

First use of the new facilities is on structural components for the nation's first 100,000 psi yield-point bridge called the New Albany Bridge now under construction over the Ohio River between Kentucky and Indiana. Over one-third of the bridge, by weight, is fabricated from high-strength, low-alloy, heat-treated steels such as T-1 and N-A-Xtra 100. These alloys call for more efficient machining methods because of higher tensile strength.

Installation of a numerical-positioning-control drilling machine, to replace radial drilling and various methods of punching, depending upon stock thickness, is considered to be the most important step in the modernization program to date. Designed and built by Walter P Hill, Inc, of Detroit, the drilling machine is controlled by a General Electric Mark IV N/C system.

One operator enough

Basically, the machine consists of a motorized run-in conveyor, a motorized beam feed roller conveyor, a motorized run-out conveyor and a high-speed drilling machine having two opposed, horizontal spindles and a single vertical spindle. One operator oversees the entire production unit.

The machine can drill or gun-drill ¾-in.-dia holes in steel at feeds up to 30 ipm. Numerical control monitors the advance and clamping of the beam (A-motion) and the positioning and feeding of each of the drill spindles (X, Y, and Z motions). Auxiliary functions such as drill feed and retract are in the automatic machine cycle initiated by the tape.

Complete machine-operating flexibility is provided by three operating methods: tape control, dial control, and manual control. Dial control enables random holes not in the programmed tape to be accurately positioned and drilled in the structural member. Manual control permits forward or reverse jogging outside the automatic drill cycle.

Floating zeros of up to 0.040 in. on all motions permit location of new or different reference points to allow for mill variations within commercial tolerances. Thus, it is not necessary to punch a new tape every time a slight shift from the original zero point is required.

One-pass painting

Called the largest in the industry, the paint conveyor includes a Mahon paint-spray booth. Two stations, one above and one below the conveyor, complete the painting in one pass. Formerly, members weighing as much as 50 tons were laid flat on the floor, painted on one side, turned over, and painted on the other side.

Most significant aspect of this $600,000 modernization investment is that it may launch a trend to "production line," automated prefabrication of large structures such as bridges and buildings. •

SHOP SHOTS

Drillpress swager forms tubes

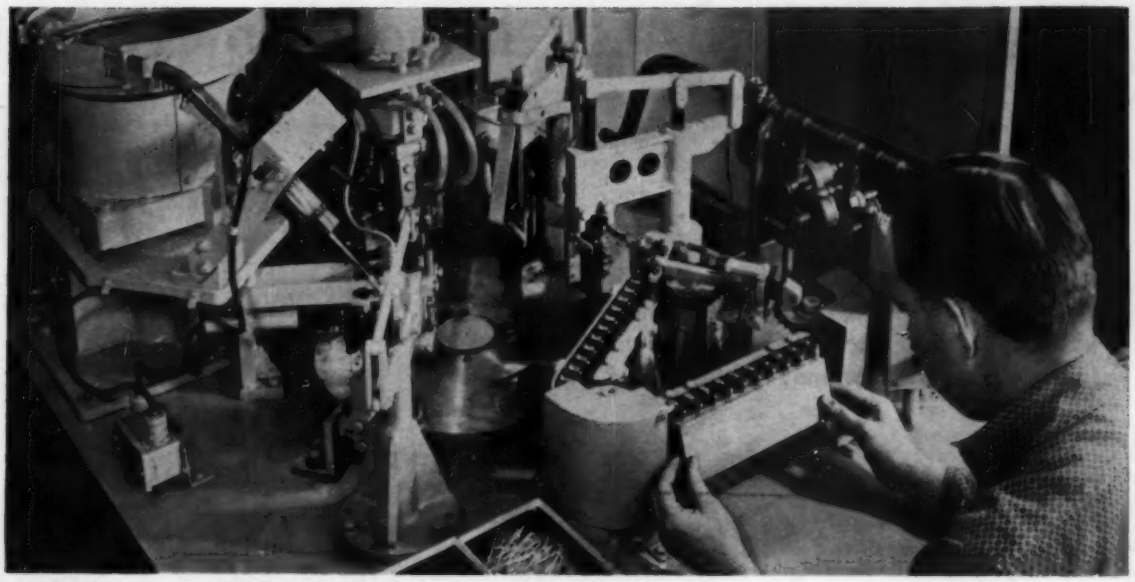
Tooling at a modified drillpress swages oil-cooler tube ends at United Air Lines' maintenance base, San Francisco. Speed at 250 tube ends/hour is twice as fast as other methods. The 17-in. Delta drill has been extended 9 in. with a block casting and longer drive belt

Carbide turns hard-faced molds to 10 micro-in.

Carbide tools cut contours on hard-faced bottle-mold inserts at Overmeyer Mold Co, Winchester, Ind, and produce a 10-micro-in. finish. The work is steel flame-sprayed with Colmonoy 6, a refractory chrome-nickel-boron alloy rated at 58 R_c. The tool is a CI-grade carbide controlled by a low-pressure stylus that follows aluminum templets. These are ideal for short runs because they are easily made. The machine is a LeBlond Dual Drive operating at constant surface speed, with rotation ranging from 125 to 1000 rpm

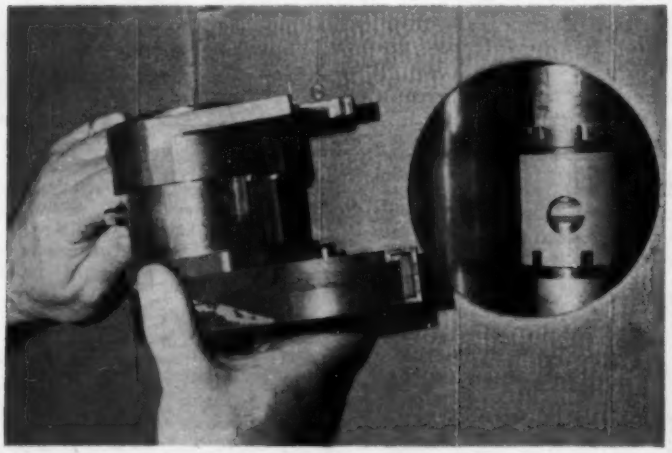
Explosives form soft metal

Blast tools at Rocketdyne Div, North American Aviation, produce a pylon shape for B-52 wing-carried missiles in aluminum. The relatively soft material (6061-T4) forms easily and quickly, and may indicate future economic operations in materials not solely restricted to the "exotic" or difficult categories



Machine assembles transistor cases

Mechanized welding unit assembles 1850 transistor cases an hour, joining gold-plated headers and caps in a controlled atmosphere. Operator loads headers ten at a time, the chain feeds them to electrode fixtures, a hopper delivers caps to the rotary table, a photoelectric station checks cap position, then a 10-KVA C-frame welding unit does the welding. Assemblies are mechanically ejected from fixtures. The big table is a leak-proof base for a dry box that fits over the whole unit, built by Precision Welder & Flexopress Corp, Cincinnati



Power wrench for tight corners

Hydraulic wrench fits into confined spaces to tighten or loosen tube fittings. Torque can be set between 25 and 62 ft-lb; total rotation is 250°. This Boeing Airplane development operates from 3000 psi produced by a Chicago Pneumatic power cell. The tool fits onto the end of a tube and is adjusted to contact a tube fitting. Torquing takes only 10 seconds

Filament winder forms plastic cone

Powered winding mandrel produces a uniform, accurate radar nose for a Lockheed F-104 Super Starfighter. The plastic filament is soaked in resin, then wound on a precision mandrel that forms the inside shape of the nose. One operator is scraping off excess resin, other controls speed

Measuring *REALLY* large diameters

By Constantine A Pappas, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Mass

Measurement of unusually large diameters (10 feet and more) calls for unusual methods. Here is a roundup of conventional techniques, together with a few advanced ones, and some recommendations for an ideal measuring system—one that may be necessary in the future

No circular part is ever *perfectly* round. On really large parts—like bearing races ten feet or more across—keeping the diameter consistently within tolerances calls for the utmost in skill.

But this precision has its justification: Reducing the out-of-roundness by only a few thousandths of an inch can more than double the service life of such large components as ball bearings that rotate giant antennas.

To get such accuracy, the manufacturer must hold close tolerances on the part's diameter during machining. And keeping the diameter within tolerance limits calls for frequent measurements — with equipment that is equal to the task.

What are some of the current techniques for measuring parts with diameters greater than ten feet? Let us examine them, then speculate on what the ideal measurement technique might be.

Anyone who measures a circular part has three primary objectives: (1) to measure the diameter's dimensions accurately; (2) to determine how much any diametral circle deviates from a perfect circle; and (3) to determine deviations of the horizontal surface (the surface whose plane is perpendicular to the axis of rotation) from a flat plane.

Stated simply, the goal is to measure diameter, roundness, and flatness.

Machining problems

Just how accurate are circular parts? In closely controlled environments, where shop facilities are elaborate, diameters can be machined and ground to tolerances well under 0.001 in. Even where there is no painstaking control, tolerances may be held to 0.001 in. In the field, where there is little or no environmental control, tolerances within 0.010 in. are possible.

No matter what the degree of control, a machined diameter will never generate a perfect circle, nor will the circle conform to a true flat in the perpendicular plane. Deviations from these ideals can come from several sources: The tooling and equipment may not be properly aligned. The machine operator may make an only-too-human mistake. A change in temperature may affect the part (a change of 1 F upon a steel ring 13 feet across can change the diameter about 0.001 in.). Or tool marks may cause damage to the surface finish.

Measurement problems

The same kinds of error—especially temperature—can affect measuring just as much as they affect machining.

Any discussion of accurate measurement must consider temperature. We have already seen how temperature can change a part's dimensions. For this reason the dimensions of a measured part should be accompanied, on the record, by the temperature at the time of measurement. Furthermore, the temperature of the measuring equipment (if it is mechanical) must also be recorded. When the equipment's temperature differs from the measured part's, corrections for the differential must be made. And when the part and measuring equipment are of different materials, adjustments for the difference in coefficients of expansion are necessary.

Regardless of the method, or the equipment that does the measuring, a record of the data is essential for analysis. If we plot curves that show the actual deviations of a circle, we can then find the directions of these excursions, pinpointing their location and magnitude. With this new information, we can correct the circle's diameter, improving its conformance to a true circle and a perfectly flat plane.

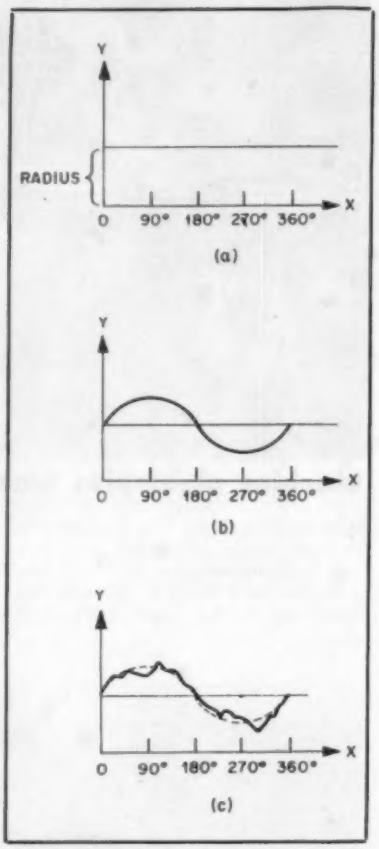


Fig. 1—Analysis of measurement data shows circumferential excursions of circular parts. In a perfect circle there is no angular displacement (a). When the diameter's true center is displaced, a sine curve results (b). Undulations appear on the sine curve (c) when the radial surface is not smooth

Fig. 1 shows some of these curves:

(a) If we plot the radius of a perfect circle on "x-y" coordinates, with the "y" axis representing the radius, the result is a straight line parallel to the "x" axis. In this perfect circle the radius is, of course, the same length at any point on the circle.

(b) When the center of the diameter becomes displaced from the true center, the plot becomes a sine curve. With the amplitude of the

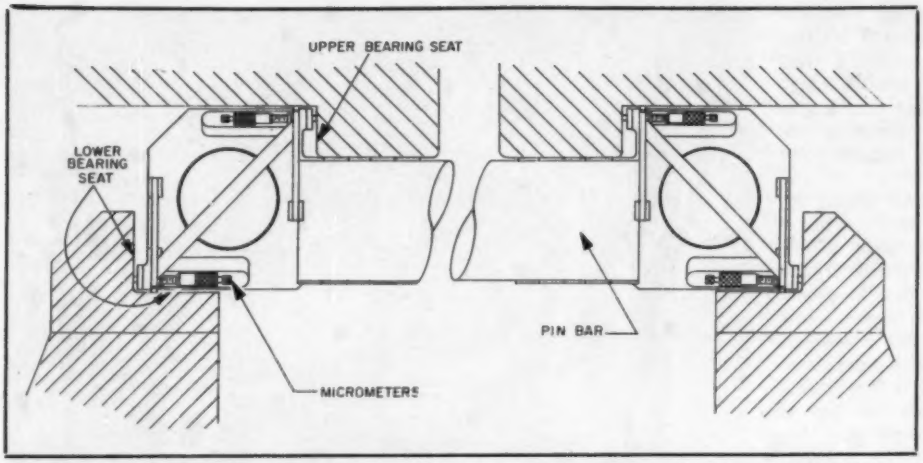


Fig. 2—Pin bar (tube with micrometers mounted at each end) measures diameter of a 13.5-ft bearing before it is removed from machine table. Inspector brings micrometer heads into contact with radial surfaces, adjusts them, and adds algebraically to get diameter reading

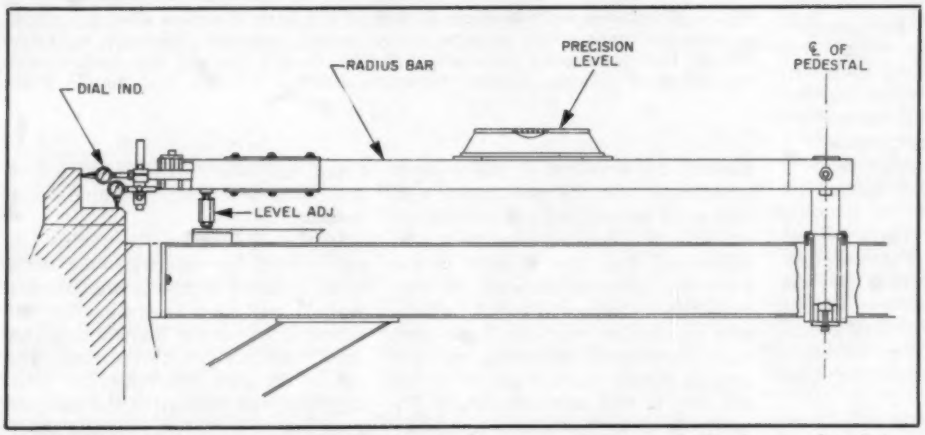


Fig. 3—Radius bar, pivoted on pedestal, takes readings every 7.5° around ID. Curves plotted from readings show roundness and flatness of the circumference

curve, and with a sine-curve equation, we can locate the displaced center.

(c) If the circumference is not smooth, that is, does not conform to a perfect circle, undulations appear on the sine curve, with their location, magnitude, and direction indicated.

In much the same way, we can plot curves that show how much—and where—a circle deviates from a flat plane. With these curves, we obtain a picture of just how much the diameter of a part has to be corrected before it falls within prescribed tolerances.

Tolerances required

At this point, it is well to point out some of the dimensional requirements for large parts. Let us take, as illustration, two large ball bearings of 10- and 13.5-ft diameter that are installed in rotating antennas. To make the bearing races and seats for these giant assemblies, the manufacturer has to stay within strict tolerances. For maximum operating life, the out-of-roundness between the bearing ring and the bearing seat has to be reduced to a minimum.

With an out-of-roundness of 0.003 in., the expected bearing life is about 90,000 hours at maximum design loads; but increasing this tolerance to 0.006 in. will reduce this life to about 40,000 hours at the same design loads. Thus accurate measurement of diameters during manufacture, and during installation in the field, is naturally of paramount importance.

For these large components, tolerances therefore are very close: Radially, maximum tolerance in 360° is 0.006 in. total indicated runout, with maximum slope of 0.001 in. in 7.5°, non-accumulative. Maximum flatness tolerance permitted in 360° is 0.003 tir, with maximum slope of 0.001 in. in 7.5°, non-cumulative.

The manufacture and installation of these assemblies involves several techniques for measuring diameters, in three types of environment. Here the bearing rings are fabricated in a closely controlled environment. The bearing-seat diameters are machined in a semi-controlled environment. And at the installation site, where there can be no such close control, adjustments and corrections must be made on all diameters.

Measuring bearing races

During fabrication, the manufacturer measures the bearing-race di-

ameter in the following manner: First the shop grinds (on a boring- or grinding-machine table) a steel ring about one-third the bearing-ring's diameter. Because this ring is ground on the same table as the actual bearing races, concentricity of the two is assured.

Measurement of this precision-ground reference ring and the bearing rings or races is with a micrometer bar. Temperature of the ground ring, micrometer bar, and bearing ring must be exactly the same; in this setup the machine's coolant stabilizes the temperature. After the final grinding in this closely controlled environment, a typical measurement might show that the diameter's radial tolerance is within ±0.0005 in. and flatness tolerance is within ±0.00025 in.

The bearing races will never be so round and flat as when clamped to the grinding table after completion of grinding. Because the races are highly tempered steel, they will not remain perfectly round and flat when released, but will assume irregular circular configurations.

To keep the assembled bearing races within prescribed tolerances, the bearing seats must be accurate enough to force the races to reassume their circular configuration. Indeed, in the assembled bearing the roundness and flatness of the inner and outer bearing seats determine how round and flat the bearing races will be when they are assembled.

Pin-bar technique

Besides the concentric-ring, micrometer-bar method, the plant has another technique for measuring the diameters of 13.5-ft-wide bearing races before they are removed from the machine table. Here a pin bar —a length of steel tubing with micrometers mounted at each end— does the measuring (see Fig. 2). The micrometers are graduated to 0.0001 in., and the pin-bar's overall length is roughly equal to the race's diameter. To make the measurement, the inspector places the pin bar across the diameter, bringing the micrometer heads into contact with the radial surface. He then adds the two micrometer readings algebraically, notes the temperature, and obtains a measurement accurate to within ±0.0005 in.

The pin bar has one primary purpose: to measure the bearing diameters on the grinder, so that the bar can be transferred to measure the *bearing seats* during their manufacture. As a result, it has several advantages over the micrometer rod. The same instrument takes readings on both the bearing-race and seat diameters. Too, bar support is the same for all measurements, so that readings are more consistent (a definite advantage over the hand-held micrometer rod). Moreover, one can readily install thermocouples in the pin bar, to find its temperature. Finally, the plant's available micrometer rods, not long enough for this largest-size race, would have to be modified to accept extensions (thus adding to the possible measuring error).

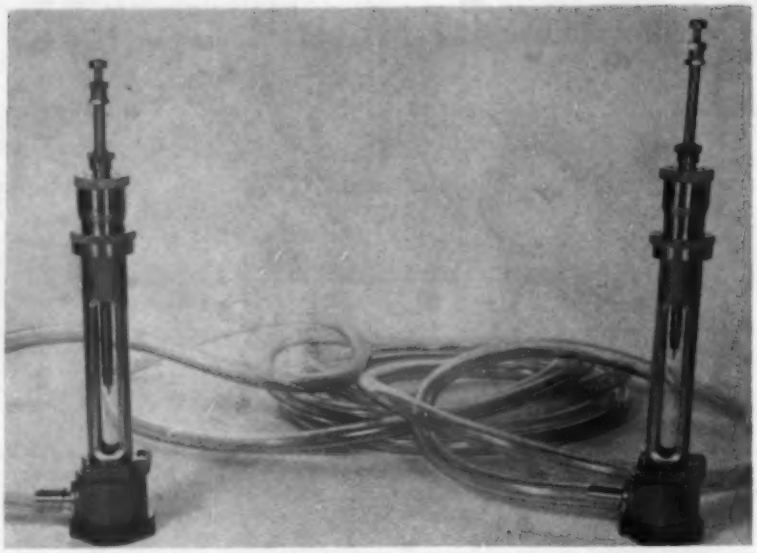


Fig. 4—Micrometer water level checks flatness and level of surface. One water level remains stationary, while other is moved around diameter. Difference in water-column heights indicates variations. Adjusting needles, brought into contact with tops of water column, measure variations. Reading is taken from needle stems

Measuring bearing seats

Once the pin bar determines the race diameter, and has been used during machining to measure the seat diameters, it is necessary to determine the roundness and flatness of the seat diameters. A radius bar (see Fig. 3) accomplishes this. As the illustration shows, this radius bar pivots about the centerline of the bearing pedestal. Two dial indicators, mounted on the end of the bar, contact the seat's radial and horizontal surfaces. At the center of the bar a precision level keeps the bar in a horizontal plane within 0.0005 in./ft.

Measurement follows this procedure: Rotating the bar, and keeping it level, the inspector takes readings from the dial indicators every 7.5°. From this data he then plots curves that show the seat's roundness and flatness.

In the same way, the radius bar can check the bearing race after it is secured to the lower bearing seat. It will also determine the inclined level of the diametral plane. And there is a still further use: The radius bar can determine the pitch diameter and runout of the internal gear on the 13.5-ft bearing race. Accuracy of this bar, if temperatures are held within 0.2 F, is approximately ±0.0005 in.

Micrometer water levels (see Fig. 4) are also helpful for gaging flatness and establishing planes. This equipment has worked successfully on 10-ft-dia bearing components. With this system, accuracies to about ±0.001 in. are possible. Here again, the inspector takes readings around the diameter, then makes a plot that shows the plane of inclination as well as horizontal surface irregularities.

(See Fig. 4 for a description of how this apparatus works.)

Further corrections

By analyzing the curves made from readings, the bearing manufacturer can make, during field installation, corrections to meet specified tolerances for the assembled bearings. For the two bearing races discussed above, these corrections were made:

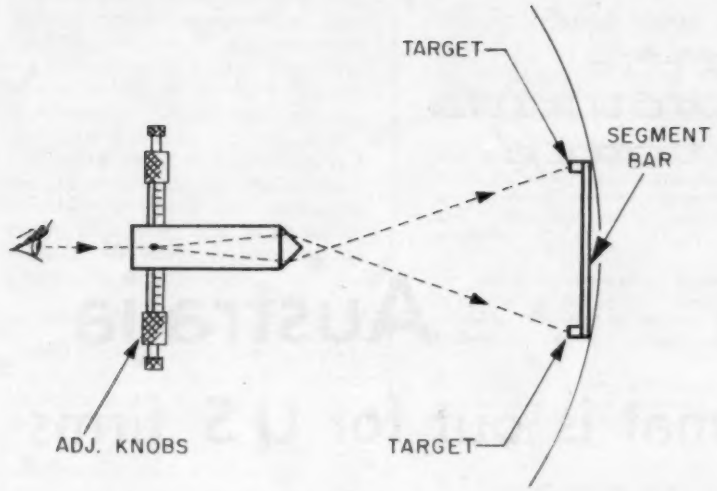


Fig. 5—Optical system meets all the requirements for a desirable measuring system. A prism, mounted on scope in center, bisects line of sight, so that inspector can align scope crosshairs with targets on segment bar attached to radial surface. This setup gives extreme accuracy

• In both bearing races the radial tolerances were met during machining.

• For the 10-ft bearing race, shim packs leveled and reduced horizontal surface irregularities to the required tolerances.

• The 13.5-ft bearing pedestal, in which the lower (or supporting) seat is machined, was designed to allow adjustment in the horizontal plane. Because horizontal surface irregularities were kept within tolerances during machining, no further adjustments were required.

Desirable measuring system

Our experience in measuring large diameters has led us to several conclusions. Some of these may be stated in a list of specifications for a desirable measuring system:

1. A single system should measure the diameter and all diametral planes, was well as radial and horizontal surface excursions.

2. Temperature should not affect the measuring system. As we have seen, error can creep into measurement when the measuring equipment's temperature is not the same as the part's.

3. The system should be flexible enough for use in any environment.

4. Setting up the equipment and making measurements should be quick and accurate. No accessory equipment and instrumentation should be necessary.

5. Personnel who set up the equipment and take measurements should not require specialized training, nor should they have to know highly complex techniques. Their work should be as simplified, and as standardized, as possible, so that human error has a minimum influence on the actual data derived from measurement.

In the design and manufacture of diametral surfaces, we can make further conclusions: (1) Whenever possible, the design should permit adjustments of the surfaces both radially and horizontally—during manufacture and in the field. (2) As diameters become larger, they may have to be segmented. Here built-in adjustment features will be a must. Diametral segments will be machined, dismantled, transported, then reassembled in the field. (3) In other cases it will be necessary to make a first-time assembly in the field—or even to machine the diametral surfaces in the field. Here again, the design must include provisions for adjustments and corrections. (4) In all of the above, the precision of the assembly will depend on the combination of easy-to-make adjustments and the measuring system itself.

Good systems available

The above discussion gives the requirements for a desirable measuring system. The following two systems, both currently available, can be recommended to satisfy these requirements:

• *An optical system (see Fig. 5) meets all the above requirements.* Here, with the telescope mounted at the center, the diametral plane and its irregularities may be determined to an accuracy of 0.0003 in. in 30 ft. For radial measurements a prism is attached to the scope, placed on the center point of the diameter. The line of sight is bisected, each line directed at targets on the ends of a segment bar (see illustration).

If the radial surface is a true circle, the scope crosshairs should coincide with the targets on the segment bar. If not, the calibrated adjustment knobs are turned to make them coincide. Then the distance and direction that the surface is removed from that of a true circle can be read directly from the adjustment knobs.

• *A second recommended system measures and generates a diameter at the same time.* Here a detector, which precedes the cutting tool, measures the diameter and transmits a signal to the toolholder. This signal, proportional to the amount of material to be removed, moves the toolholder accordingly.

In this system, another element may follow the tool, for indicating and recording the final measurements. The advantage is that diametral generation and measurements can be done simultaneously. Because the time lag between machining and measuring is negligible, the influence of temperature is also negligible; as a result, accuracy increases.

The ideal system

What kind of measurement system would combine all the desirable features outlined above?

The most desirable system of all would be one that measures and simultaneously indicates and records—and does all these things automatically once it is set up. In this system, human error and temperature error should not exist. In addition, the entire operation could be performed very rapidly.

This ideal measuring system would include all the desirable features we have discussed. It would combine optical measurement with simultaneous indicating, recording, and diametral generation. Once the equipment had been set up, the entire operation would be automatic. And if the equipment design were modular, any combination of requirements could be fitted into the system. •

THIS METALWORKING WORLD

Australia

—Welcome mat is out for U S firms

With a fast-expanding domestic market and unlimited opportunities for trade with the free Orient, Australia welcomes U S metalworking partners. This is the sixth in a series of reports from principal metalworking nations of the world.

Industrial frontier, gateway to the Orient, Western island set in an Eastern sea — Australia cannot be neatly pigeonholed. It is a unique combination of 20th century Wild West and sprawling modern cities.

From Brisbane on the north to Melbourne on the south, its industrial cities form a coastal crescent geographically approximating that from Washington, D C, to Miami in the United States. Australia is just about the size of the United States, too, yet its population is less than that of metropolitan New York City.

It is a rich and growing market for metalworking. Scores of American companies in fields ranging from electronics to appliances to heavy industrial equipment have already been welcomed to Australia — and the welcome mat is still out.

At this moment, a dozen-or-so New South Wales firms (in the Sydney, Melbourne, and Newcastle industrial belt) are seeking to affiliate themselves with American metalworking companies — either technically, financially, as market outlets, under licensing agreements, or in actual production or assembly. (See listing at far right).*

Australian industry might in effect be called a huge jobbing shop with open time and facilities for producing and marketing the products of U S metalworking. Long-established Australian firms are seeking to expand their facilities and product lines to meet a fast-growing domestic market for everything from cameras to trailer trucks.

Not only is the Australian economy expanding to meet the needs of a prosperous, fast-increasing population (9.1 million in 1955, 10 million this year) but also to serve the virtually untapped markets of the underdeveloped countries of Southeast Asia and the Orient.

American metalworking companies have not been slow to take advantage of the opportunities offered by the Land Down Under. Upwards of 200 of them are today operating in Australia, while many times that number have licensing agreements of one kind or another with Australian firms.

A partial list of U S companies operating in Australia: Admiral Corp, Allis-Chalmers, Armco, Baldwin-Lima-Hamilton, Bendix Aviation, Blaw-Knox, Borg-Warner, Budd, Burroughs, J I Case, Cater-

Assembling a General Motors-Holden car at Pagewood, New South Wales. Australia's entire automotive industry is US-owned or controlled. GM, Ford, Chrysler and American Motors all have one or more plants there

*Detailed information on the listed companies may be obtained from Dr Arthur Denning, Commissioner, New South Wales Government, 469 Fifth Ave, New York 18, N Y. Please specify the number of the company (see listing) in which you are interested.

pillar, Dana, Eastman Kodak, Gillette, Ingersoll-Rand, Harnischfeger, IBM, International Harvester, Joy, Link Belt, Motorola, North American Aviation, Philco, Raytheon, Rheem, Sunbeam, Western Electric, Westinghouse, General Electric, Zenith, Yale & Towne.

In addition, U S companies entirely control Australian automotive manufacture: Ford, GM, American Motors, Chrysler, and Studebaker-Packard all have, or contemplate establishing, plants there.

$1 billion US outlay

Even with all this U S investment, which amounts to nearly $1 billion, Australia is still a wide-open frontier for metalworking. The Australians would like, for example, to manufacture and market the end products of U S research and development, because they haven't the facilities to carry R & D to such extremes themselves. Those Australian firms with available facilities, and they are many, would prefer to team up with U S companies that have proprietary products which can be mass produced.

To such companies, private Australian firms can offer a ready-made, trained workforce at low-by-U S-standards wages (average weekly wage rate for metalworking industries is around $40), plus unlimited press, toolmaking, sheetmetal, machining and foundry capacity.

1000 licensing agreements

That's for a manufacturing partnership. An even greater number of Australian companies, ranging from large shops with equipment and capacity to manufacture appliances and other consumer goods, even automobiles, are looking for U S subcontracts and licensing agreements.

Whether an American company wants to manufacture or license, Australia offers a foothold in a growing market, and the government of New South Wales (Australia's major industrial state) offers to research that market extensively. It will also, in the case of a U S company moving in to manufacture, help choose plant sites and line up services.

The Australian domestic market, which today serves some 10 million people, plus another 2.3 million in nearby New Zealand, is expected to grow as much as 50% by 1975. Wages, too, are increasing rapidly (325 Index in 1955, about 375 Index today). This subcontinent, obviously, is by no means a distressed area, as are so many nations offering inducements to incoming American industries.

On the contrary, it is a commonwealth of prosperous states—from the tropics in the north, to the great ranches of Western and central Australia to the highly urbanized and industrialized south and eastern coastal regions. It not only offers a prosperous domestic market but a fast-growing outlet for U S products in the free Orient.

So eager is industrial New South Wales to welcome partnerships with American companies that it has just appointed Dr Arthur Denning as full-time Commissioner for its office in New York. As such, his main task will be to act as liaison officer in cementing agreements between private companies in the two nations.

Aside from the growing domestic Australian market and the great potential markets of Southeast Asia, Dr Denning cites as inducements lower tax levels, remittance of dividends, tariff assistance, democratic government, high educational standards, good industrial relations.

"Demand," says Dr Denning, "is increasing daily for almost any metal you can name — from railway tracks to thumb tacks." •

THESE FIRMS WANT U S PARTNERS

1. Large Australian firm ($5 million assets, $20 million sales) will join U S firm in large-scale manufacture of light metalworking products, molded plastics, or electrical products. Has land and buildings, some capital available

2. Division of major manufacturing combine (coupling and gear drives, conveyors, mining machinery) wants U S firm interested in Australian market, with eye to ultimate production. Suggests distribution and sales arrangement to start, and if setup goes well has unlimited manufacturing facilities, expansion capital available.

3. Maker of broadcasting systems and communications equipment has 20,000 sq ft of sheetmetal, machine shop and assembly facilities, plus test shop and lab available. Interested in licensing agreement in electronics field, would consider financial and technical merger.

4. Maker of drilling tools and equipment, with own forge shop, boilermaking shop, machine shop is interested in technical exchange arrangement to extend product range in heavy metalworking. Would consider manufacture of earthmoving or mining equipment.

5. Maker of precision gages and tooling seeks U S firm interested in having proprietary products manufactured in Australia. Air-conditioned plant employs 32 toolmakers, fully equipped with precision machine tools, forming and molding equipment.

6. Refiner of precious and semi-precious metals (for jewelry) seeks financial and technical partnership. Wants to expand into new lines, has 16,000-sq-ft plant. Also makes industrial furnaces, lab equipment, refractory cements.

7. Small manufacturer of slide and strip film projectors and microfilm readers seeks U S firm desiring to license manufacture of electromechanical or electronics equipment. Has small plant in Sydney, will expand if necessary.

8. Major company with capacity to produce castings to 50 tons, fabrications to 65 tons, and pressure vessels of all types wants licensing or technical agreement with U S firms. Has machine shop with large gear cutters, forging shop, storage space, rail siding.

9. Firm with wide range of compression and injection molding equipment (makes control switches for appliances and industrial use) seeks to affiliate with U S electrical equipment maker.

10. Maker of earthmoving equipment (crawler tractors, front-end loaders, scoops, rippers, farm equipment) wish U S affiliation to extend product range in this field or in an industry in whch they can make use of boilermaking plant, welding facilities, construction know-how.

11. Established steel fabricator and pressure vessel maker, with job shop facilities for nonferrous casting and general machining (16,000-sq-ft plant) wants U S firm to join in manufacture of proprietary products—chemical process plants, hydraulic presses, bending brakes, shears, bulk handling equipment, oil burners, valves, hand tools. Will consider financial or technical arrangement, or both.

A reader's plea:

Let's drop those clumsy fractions!

Substitution of basic two-decimal figures for complex and cumbersome fractions in non-critical dimensions could go a long way toward simplifying shop practice

By Don R King

Normally, engineers and shop men avoid such fractions as sixty-fourths and thirty-seconds, not only because they are difficult to measure with a scale but because they are cumbersome to deal with in other ways.

Let us instead have a two-digit decimal as soon as possible. Not one that is merely a pseudo-decimal code of fractions, but a truly rounded-off decimal dimension. Such simple, basic two-decimal figures as 0.10, 0.20, 0.25, and 0.30 are good enough to express many dimensions. Automotive firms, for example, prefer decimal thicknesses to gage numbers for sheet metal.

Engineers like the idea

And engineering societies are beginning to see the wisdom of two-digit decimals for dimensions that are not critical. Maybe the rest of us can benefit by extending the idea. In other words, maybe we can use these odd-ball fractions to snap the shackles that hold us to the fractional system altogether!

Suppose we look at some common fractions and their decimal equivalents:

3/16 = 0.1875
13/64 = 0.2031
7/32 = 0.2187

Which one is preferable? Obviously, we reject 13/64; it is just too cumbersome. But round off 0.2031 and write it as 0.20. Now, it takes on a new look. It's almost too simple. It appears to be the ultimate in writing a preferred size.

What happens if we agree to write 13/64 as 0.20 and adopt it as a preferred size to replace not only 13/64 but also 3/16 and 7/32? This figure has some unusually attractive uses to hasten full acceptance. It could become the "fractional" tap drill size for the much-used ¼-20 screw, and thereby eliminate the clumsy expression "No. 7 (0.201 in.)." It could also be a clearance-drill size for the No. 10 screw.

Other uses for 0.20 are not hard to find. Leadscrews with a 0.200 in. lead are common. A dowel pin in the 0.200 in. size would find ready use. The 0.20 in. dimension could become a standard fillet or corner radius. Likewise in many applications for locating and gaging purposes, a 0.100 in. radius is appealing. Corner breaks on machined parts, now called for as 1/64 or 1/32, according to the designer's mood, could well be made 0.02 in. as standard. This division is found on machinist's decimal scales.

Ignore small differences

While we are getting used to 0.20, we will find that the small discrepancy between 0.200 and 0.203 can be ignored. The change will be mental rather than physical. Eventually, as supplies are used up, tools like drills, end mills and cutters can be adjusted to conform with the exact size—0.20. The same situation will apply to materials. No problems should occur if initial consumption is restricted to purposes where "fractional" dimensioning has been permissible all along.

Objections might arise to mixing fractions and decimals. We already use such mixtures. Expressions such as "⅛ x 0.20 x 2½" may be a little surprising but should not be misunderstood.

At some later time the fractions; 3/64, 19/64, 45/64, and 61/64, could be likewise worked over, either singly or in a group, resulting in desirable dimensions—0.05, 0.30, 0.70, 0.80 and 0.95. These would ultimately become available in the exact size by the same process.

We would have to agree that ⅛, ⅜, ⅝, and ⅞ are too firmly established to consider changing, and that 5/16 (or 0.31) should be included, because it is a commonly used screw size. If these fractions were to be handled in a consistent manner, their two-digit form would become a *code*, and a special meaning would apply, i. e. "basic" would be the exact old fraction. Add these to our quarters and half, we now have a quite complete set of simple decimals, at least in major increments:

.05 .12 .20 .25 .30 .31 .37 .50 .62 .70 .75 .80 .87 .95

Progressive abandonment

At some future date, with increasing usage of the more convenient decimals, the remaining fractions in the series would take on a different complexion. Fractions once considered fairly acceptable would become little used, probably discontinued for fits, and be relegated to about the same status as sixty-fourths have today. They would then be amenable to the same treatment, or in a few cases, simply abandoned.

It all comes down to this: the despised sixty-fourths can be the means of ridding ourselves of fractions forever by using them as the nucleus of a true decimal system. Let's start with "0.20", and glamorize others in turn. Thus, an ugly fraction can be transformed into a Cinderella dimension—and two stepsisters pushed into the background at the same time.

Reader King proposes one form of decimal inch; other forms are now in use. The editors will welcome your point of view on this controversial subject. •

Russia develops ferrous concrete press

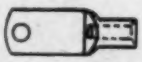
The Russians, faced with the need for creating an 8000-ton capacity press and shipping it to a remote destination, found that if they were to make it of metal, special transport facilities would be needed, and special casting facilities would be required.

Instead, they have designed one of pre-stressed ferrous concrete, which is not only much lighter and easier to transport but costs just about one-fourth as much as one of metal.

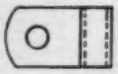
Actual cost is expected to be about 2-million rubles (based on the old standard ruble rate of about four for one U S dollar), compared with an estimated cost of 8-million rubles for a metal press of the same size and capacity. •

THE BASICS OF SOLDERING

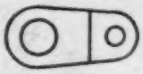
HOW TO SOLDER



HOW TO TIN



HOW TO HANDLE WIRES



HOW TO MAKE GOOD ELECTRICAL CONNECTIONS

Edited from "Soldering and Workmanship for Reliability", a manual prepared by the Aeronautical and Ordnance Division, Minneapolis-Honeywell Regulator Co., Minneapolis (Manual now being revised for M-H Military Products Group, and will be published in May, 1961).

American Machinist / *Metalworking Manufacturing* *Special Report No. 502* *February 6, 1961*

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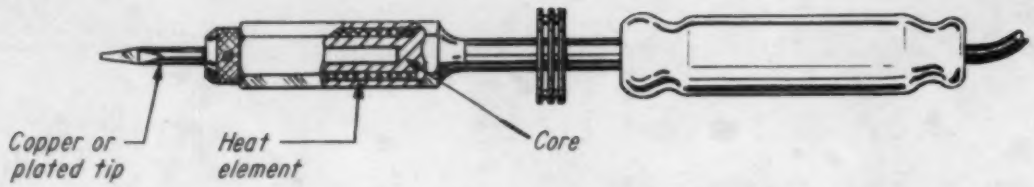


External-element soldering iron has a heating coil and a heat-holding core drilled for the tip. Fins on the shank keep the handle cool

Soldering is easy, as any do-it-yourself hi-fi addict can tell you. All you do is heat the joint, dab on some solder, and there you are.

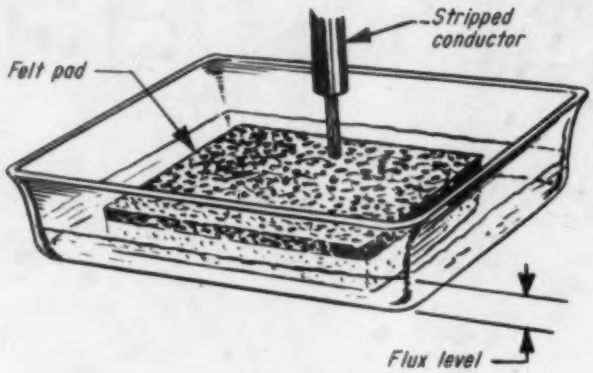
But this kind of hit-or-miss attitude is absolutely forbidden if the soldering work is headed for an aircraft, missile, or even commercial radio assembly. Soldering may be an easy art to pick up, but it is also a specific science with definite rules and regulations.

The technique has five main steps:

1. Clean the work.
2. Apply flux to remove surface metal oxides.
3. Heat the work where you want to apply solder.
4. Apply solder, letting it flow by gravity and capillary action between the parts you want joined.
5. Allow to cool without disturbance to leave solid interface alloys in the joint.

Simple enough; but the best industrial practice specifies that you follow set procedures and observe many special rules. For example, the amount of heat in the joint is most important.

Pure tin melts at 450 F; pure lead at 621 F; and most alloys of the two metals at some temperature lower than 621 F. However, practically all of the tin-lead soldering alloys resolidify at 361 F. Some of these alloys reach their liquid points at higher temperatures than others, which may cause trouble in the in-between stages—a pasty, mushy state between solid and liquid. If the temperature in the join never goes beyond the liquid point, the result will be a "cold" joint without strength.



Felt pad in a pan controls flux application when a stripped wire is dipped before tinning

Cleaning

This is a vital step, because solder will make a good connection only with clean, bare metal. Any metal has an oxide film, even if it is thin and invisible. This has to be removed before a surface alloy can be formed. The way to clean before soldering is with a flux, sometimes applied as a liquid, and sometimes as a rosin core in the solder. However, flux will not remove paint, dirt, or oil, so good mechanical cleaning or a solvent may also be required.

A flux made of water-white rosin in an alcohol or turpentine solvent will do light cleaning. Flux residue after soldering, not neutralized by soldering heat, must be removed. Activated flux, the same rosin base with an energizing agent added, removes more difficult oxides, but residue should be removed with an organic solvent or deactivated by a high-temperature bake at 300-350 F for 15-20 minutes because it might cause corrosion later. Degreasing is not often practical with electronic circuits, so hand cleaning with trichlorethylene or chlorethene may be necessary. In some assemblies, the slight film these cleaners leave may not be allowed, so final cleaning can be done with special solvents.

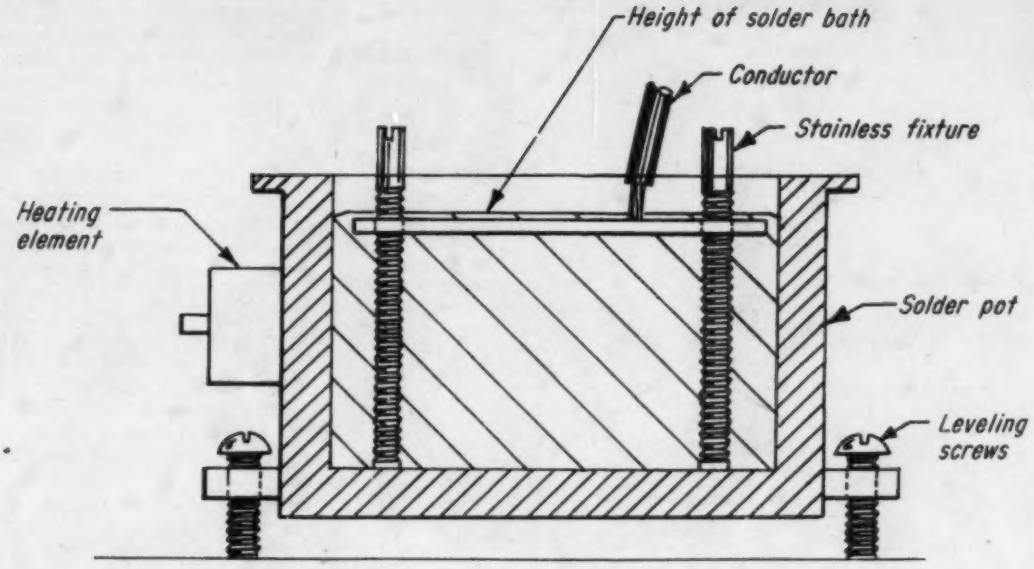
Acid or any other non-rosin fluxes are seldom applied to electronics assemblies, and then only for special reasons and with special handling.

Heating

Soldering irons come in two general types, but they look much the same. An external-element iron has a toaster-style resistance winding wrapped around a metal core that transfers heat to an inserted tip. The tip is easily replaced, and the resistance wire can be replaced. An internal-element iron has its own heating element built into the tip. Both are replaced if the iron fails. Two-heat irons run at low temperature when idle but switch to high heat when picked up from a holder at the bench.

Resistance soldering, where the work is heated by its own electrical resistance to an applied current, is a method that requires more tooling but produces high heat at high speed. A resistance unit works with 6 volts or so, stepped down from regular plant voltage, for reasons of safety and to prevent arcing. Often most of the soldering heat comes from the internal resistance of the probes, which then conduct heat to the work.

One probe will operate if the work is grounded, but most often a pair of probes applies current—and two are preferred. If the work shape demands, either probe may be formed or filed away to particular shape to clear any projection on the work.



Depth-controlled soldering bath allows tinning without wicking. A short section of wire exposed next to the insulation will remain tin free—and tin will not flow up under the insulation

High-frequency induction soldering is a fairly new process that is fast, easily mechanized for automatic control, and accurate. It produces most consistent joints in the work; but it will work only with certain types of joints, and it is expensive. One disadvantage is that it requires electronic maintenance for the controls and timers. Parts designed for induction soldering must have 0.003 to 0.005 in. of clearance between mating faces. In actual practice, induction soldering is limited in speed because the flux must have time to work on the metal parts.

Dip soldering is a fast method adaptable to high production, which is why many printed or plated circuits are dipped. A molten solder bath is usually held at 100 to 150 F above the normal melting range of the solder. Parts are cleaned and fluxed beforehand, then dipped rapidly so the hot solder will not damage the circuit board or the preplaced parts.

Special requirements include close temperature control, metal replenishment in the bath to maintain the solder-alloy proportions, and dross cleanout to keep the bath pure. One way to keep the surface of the bath clean is to install an automatic wiper; but overflow or special pumping arrangements are also applied. The bath must be cleaned out if contamination with zinc and copper goes beyond specified limits. New metal is always added as fresh ingots, not as scrap metal.

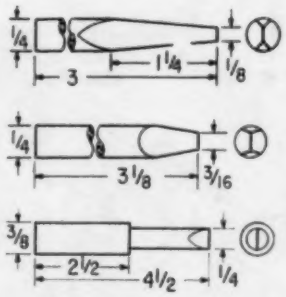
Wicking action, where the solder draws up into holes and spaces in the circuit board because of capillarity, is a good indicator of soldering conditions. If the solder fails to wick, or if the solder appears gritty when it cools, the bath may be contaminated.

Oil-bath soldering uses peanut oil held at a temperature of 400 to 425 F as a heat source for 60%-tin, 40%-lead solder. Parts to be joined are cleaned, fitted with preforms of solder, fluxed, and then submerged in the hot oil. After the solder flows, the parts are removed from the oil and cleaned in a hot vapor degreaser. (The preforms are pieces of solder metal formed to size and shape.)

This is a specialized process for easy-to-clean assemblies and for units that include glass. Heating qualities are uniform, and the preforms mean that solder quantity is exactly controlled. Higher-temperature solders may be applied, too, but the peanut oil tends to break down rapidly when bath temperature goes up.

Ultrasonic soldering is relatively new, and has only limited application as a production tool so far. Most work has been done with tin-zinc solders to join aluminum. Ultrasonic vibration (which does not replace heat) improves "wetting" action on materials where there are severe oxide problems; no flux is required.

Oven soldering is an old high-production technique (applied, for example, on radiator cores for automobiles) that requires fixtures, pre-



Typical soldering-iron tips may be solid copper or copper with a special alloy coating. Tips can be filed for special jobs

Solderability of metals

Good Solderability:

- Gold
- Hot tin dip
- Reflowed tin plate
- Hot solder dip
- Reflowed solder plate
- Solder plate
- Tin plate

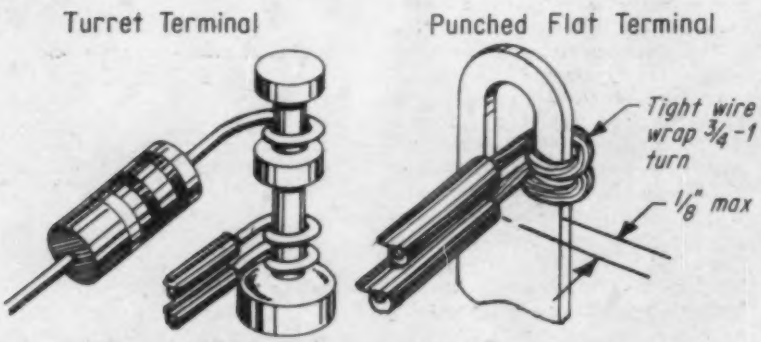
Fair Solderability:

- Copper
- Silver
- Cadmium plate

Poor Solderability:

- Nickel plate
- Rhodium plate
- Brass
- Mild steel
- Chromium plate
- Stainless steel
- Aluminum

Note: Poor solder joints may include excessive solder, cold joints (no bond, grainy appearance), fracture (parts moved from the solder hardens), or rosin joints (residue may insulate the joint from the solder).



Pin and flat terminals both require wrapped wire. Leads should be wrapped ¾ to 1 full turn and should follow contour of terminal

forms, and an oven temperature 100 F over the melting range of the solder. This demands the usual cleaning and fluxing, and also requires close part tolerances.

Soldering-iron maintenance

A soldering-iron tip is an expendable tool that requires frequent reconditioning and regular replacement. For fast, continuous soldering, it should be held at about 750 F. A lower temperature slows down heat transfer, and a higher temperature contributes to excessive scale, tip freezing (in the core) flux burning, tin deterioration, and short tip life.

The working surface of the tip must be well tinned and clean. Scale on the exposed end and inside the iron acts as a heat barrier and reduces heat-transfer efficiency. A solid-copper tip can be filed and retinned often; but when it shortens down close to half its original length it should be replaced. Less tip copper means less heat load and a higher temperature inside the iron—and at the tip. The tip must bottom in the soldering-iron hole because unfilled space here reduces the heat load and allows the iron to overheat.

A dirty or discolored tip can be cleaned by applying rosin-core solder and wiping it on a lint-free pad or brass brush. Scale must be filed off; then the iron is retinned. Whenever the iron is stored during an idle period, it should have a minimum amount of solder on the tip.

Plated tips cannot be redressed in the shop because the plating is usually 0.005 to 0.008 in. thick. They can be brightened with rosin flux and solder, then wiped on a pad. Reconditioning and retinning should include light wire brushing or sanding to remove scale, dipping in a chloride flux, then dipping into molten solder. Chloride flux residue must be removed with alkaline cleaner and hot water before the tip is used on electronic assemblies.

Standard soldering irons range from the pencil types—6 watts, weighing 1 oz—to heavy-duty sizes at 200 watts, with ⅝-in. tips, weighing up to a pound. Temperature ratings are all in the range from 600 to 850 F.

Wire tinning

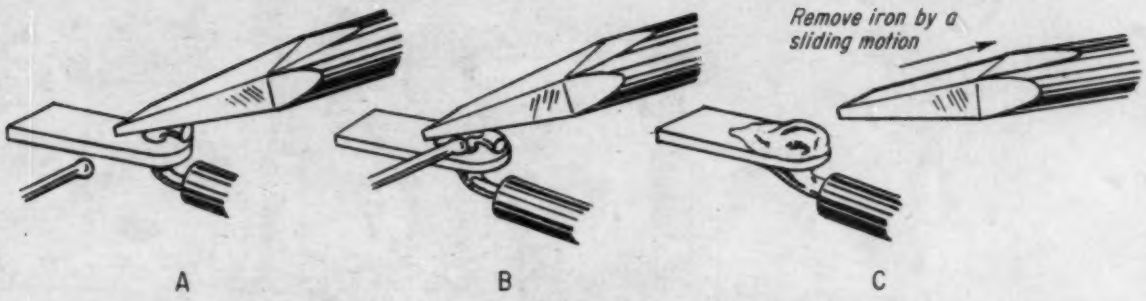
The most common assembly operation that requires solder is wrapping or looping a wire around a terminal, where the wire must be soldered. First, the wire must be prepared so it can be assembled, and so it will carry electrical current.

The thing to watch for with stripping tools of any kind is damage to the wire, which will increase electrical resistance and may seriously weaken the assembly. Strippers must have sharp blades, and must cut wire insulation neatly. Stranded wire must stay twisted, or be retwisted to its original condition.

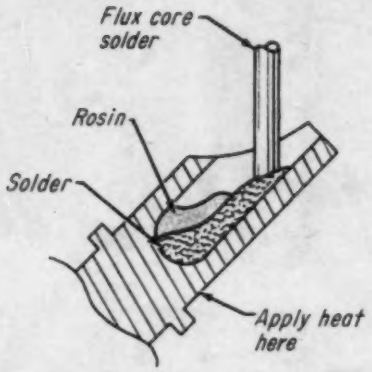
Wire ends can easily be fluxed by dipping them into a flux bath fitted with a felt pad. The flux level must be maintained to cover the wire without soaking the insulation.

Tinning is done in a solder pot with depth control that allows solder only to flow up close to, but not under, the remaining wire insulation. There should always be a bit of bare wire showing next to the insulation.

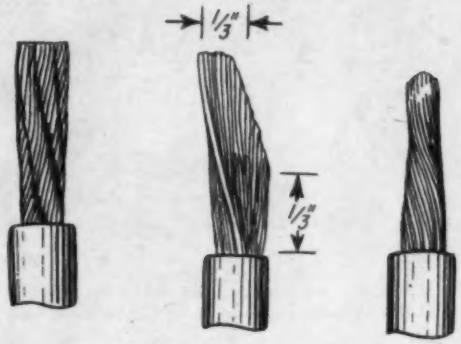
Wire is wrapped three quarters or a whole turn around pin terminals,



Wipe and flow with a light touch for the best soldering job. Even if a hole remains in the terminal, don't put on solder with a trowel



Prefill solder cups at an angle to let the flux boil out. This lets solder fill the cup bottom solidly



Stuff an oversize stranded wire into a cup or terminal by trimming, then twisting the strands to make a smaller diameter cable

and the same amount through and around punched terminals. Stripping and tinning must be planned so the insulation is about ⅛ in. away from the terminal.

Most wiring should be arranged so there is a mechanical joint (wire wrapped around the terminal) plus a soldered joint at each connection. But to prevent physical strain, and to allow slack so a part can be replaced if necessary, wired components with pigtail leads should be arranged so a bend in the wires is left as slack. Soldering is not intended to be the sole mechanical clamp in a connection.

There are standards for separating soldered connections at terminals, too. For up to 100 volts, 1/64 in. is enough, and the space increases proportionately to ¼ in. for 1000 volts, with an additional 1/32 in. for each 1000 volts more. Splicing is always to be avoided. When wires or bundles of wires pass through a chassis hole, a rubber grommet will prevent chaffing and possible shorting.

Soldering practice

Mechanical cleaning, degreasing, and fluxing are all methods of cleaning the work before soldering—and conditions at the work determine how many or which of these methods apply. Most often in electronic work there will be infrequent need for heavy cleaning, but fluxing will always be required.

After the mechanical joint has been made, apply the hot soldering-iron tip to the joint, making as good physical contact as possible to provide maximum heat transfer. When the joint has heated some, apply the flux-core solder to the joint—not to the soldering-iron tip. If the joint is hot enough for soldering, it will make the solder flow.

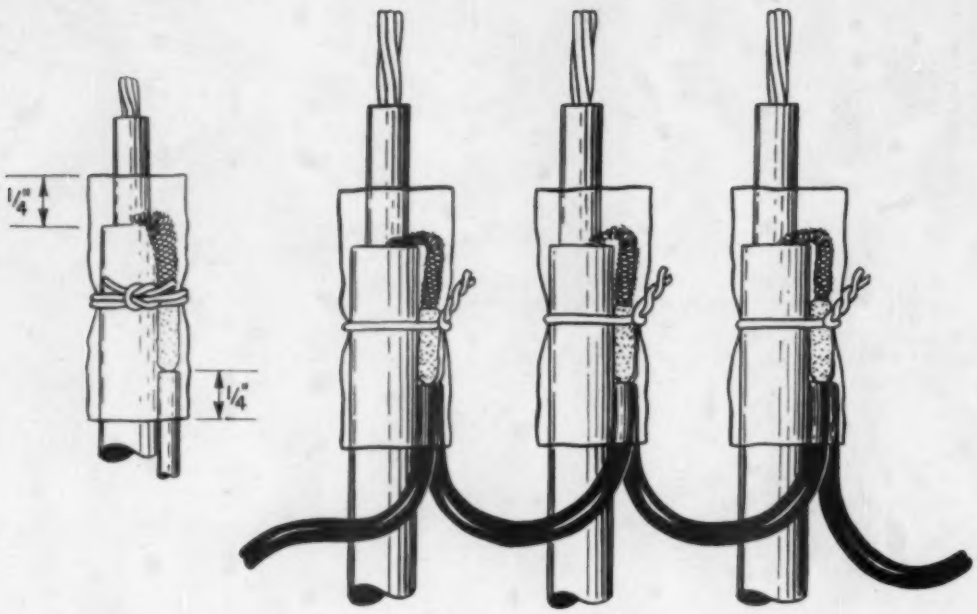
Apply only enough solder to connect the parts at the joint, making moderate fillets between terminals and wires. When this much solder has melted into the joint, remove the solder. Then, with a wiping motion, withdraw the iron. The wipe tends to remove excess solder and prevent spiking (forming a spike of solder that may cause electrical trouble).

By now the joint should include enough solder to electrically join all parts at the joint, to form smooth but not large fillets between parts, and to make smooth, tapering contact with all parts. A heavy ball of solder is poor practice; but when solder fails to flow on one of the elements, the job is equally poor.

Soldering defects

Some of the many possible troubles at a soldered joint are obvious; others may need explaining:

- Insufficient solder—each part in the joint must generally be filleted all around, on all sides touching the joint or terminal.
- Cold solder—a gray, mushy appearance without high luster—caused by poor heating or hasty work.
- Rosin joint—dirt on the parts, excessive flux, or low heat may leave rosin flux between parts in the joint. This must be boiled out so solder does all the joining.
- Excess solder—the outlines of wire and terminal should be apparent after soldering.
- Insulation burned — from too much heat, a slip with the iron, or by dripping solder.
- Insulation frayed—by poor stripping or rough handling. It can be repaired by coating it with lacquer.
- Insulation backed off—caused by



Leadwire for shielded cable should be treated to make shorts impossible. Plastic sleeves improve reliability, and so does good cable dress

too much heat, poor stripping, or if the insulation slips on the wire.

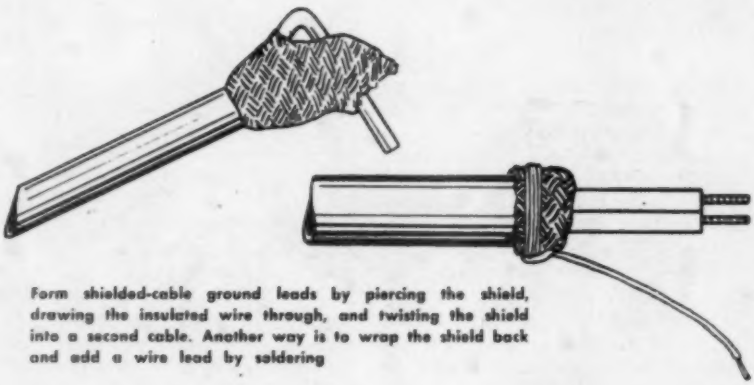
Soldering cups

Plugs and receptacles into which lead wires have to be soldered have terminals called solder cups—actually blind holes that complicate the soldering job because any excess flux must float to the top of the solder or it will interfere in the joint.

Cups can be heated by conduction or by resistance, but resistance is preferred. For one thing, a soldering iron will have to be well tinned to transfer heat efficiently, and the tinning solder may deposit on the outside of the cup—which is normally not desirable. Another reason is that heat is applied, by resistance, to the bottom of the pin or cup (with a probe). This concentrates heat there, and reduces the chances of creating voids. Resistance heating is also faster and more concentrated.

To avoid arcing, the resistance-heating probe must be held firmly against the pin or cup; therefore, a holding fixture for the work is normally required.

Heat in the cup does two things; it activates the flux to dislodge oxides on both the cup and any lead wires, and it melts the solder. If the proper technique is followed, the impurities will float out of the cup on top of the solder along with excess flux.

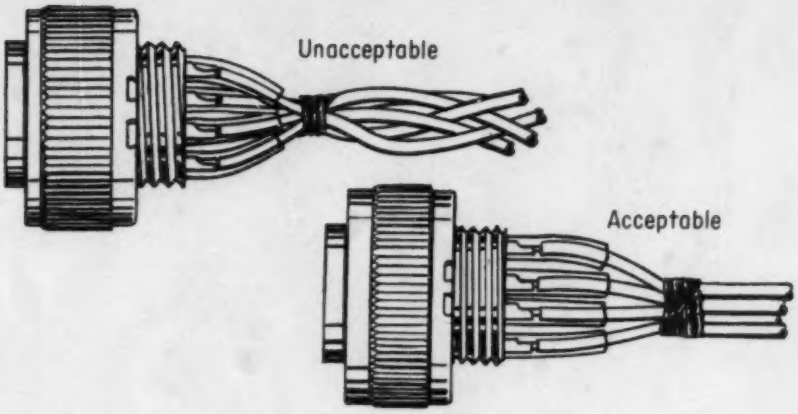


Form shielded-cable ground leads by piercing the shield, drawing the insulated wire through, and twisting the shield into a second cable. Another way is to wrap the shield back and add a wire lead by soldering

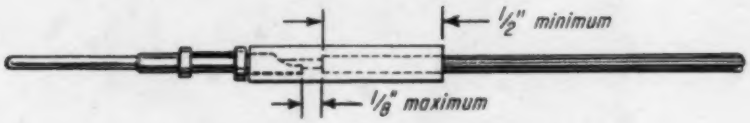
Rosin-core solder, thinner than the ID of the cup, is applied, this is usually 60/40 alloy with flux content of 1% of solder weight. The cup may be prefilled with solder before a wire is added—though the cup will normally not be filled, but only fed the necessary amount of solder to make a good joint. Inserting the wire lead before the solder is not desirable because solder is harder to add, and there is more danger of wicking. This is the action when solder creeps up a lead wire, often penetrating up under the insulation, which may become damaged. Overheating and excess solder cause wicking.

Cup soldering often involves multiple terminals or pins, and the connector must be fixtured so an operator can solder from left to right across several rows, starting at the bottom and building to the top.

Wires must bottom in all cups, and insulation must be stripped to leave a small gap between the top of cup and the end of the insulation.



Connector assembly needs insulating sleeves, neat wire dress, and cable ties. These all reduce shorts and improve physical strength



Tubing protects solder-cup joints against dirt, abrasion, shorts, and bending

These should be pre-tinned wires, if possible. Hollow-core terminals are treated in much the same way as soldering cups.

Resistance-heating irons should be switched on only after good contact has been made; switched off after solder has flowed onto the lead wire.

Oversize stranded wire can be inserted in a cup by fanning the wire, making a diagonal cut across the end (see sketch), and retwisting it to smaller size. Double wires should be stripped, spliced, and tinned before insertion.

Shielded cable is a little more complicated, because both the inner conductor and the external wire-braid shield must be soldered to terminals. If the shielding is loose, it can be separated into its own strand (see sketch) and soldered. Tighter shield may be cut back and bound with bare wire, to which a bare grounding lead can be added. Shielded leadwire can also be assembled to a grounding wire inserted through the excess shield (see sketch), which may be useful when connecting up multiple shielded wires.

Harness

Wiring for an assembly may be prefabricated into a harness, which can be made up in a fixture, then moved to the assembly where only the ends of the connecting wires need be soldered to related parts and hardware. A harness keeps all wires dressed in the required locations; it is also neat and strong mechanically. A harness is difficult to repair, and often must be replaced, especially on government contracts.

Printed circuits

High production, and sometimes precision, even if at low production, may demand printed circuit boards. These are soldered under the same general conditions of cleanliness and arrangement as for any soldering.

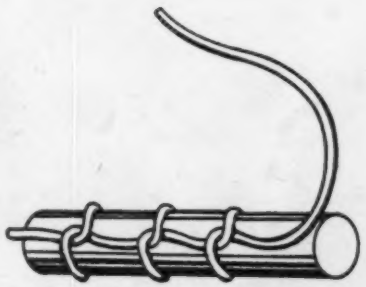
Circuit boards may be dip-soldered by following several simple rules. The board should be fixtured for proper support, then fluxed. If necessary, the board might be preheated. Soldering and cleaning follow.

A minimum amount of flux and solder should be applied. Flux is applied by brushing or by pressing the board against a saturated pad. This controls the amount of flux and applies it uniformly.

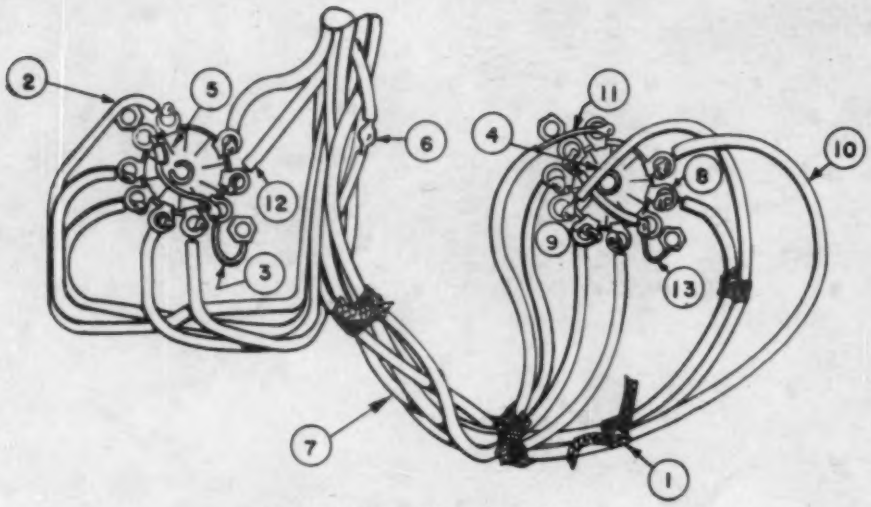
Bath solder should be maintained at 550 F. The size of the pot is important because a sufficiently large mass of melted solder will not change temperature appreciably when a new circuit board is immersed. Approximate time per dip is 8 seconds, because more exposure will damage the components mounted on the circuit board. The board, mounted in a fixture, should be dipped at an angle (to prevent gas pockets), leveled, then removed at an angle to drain excess solder.

Component leads are normally placed through holes in the board and bent tight to the track on the opposite side. Stranded wire must be handled carefully to prevent strands from jumping across a space to another conductor line.

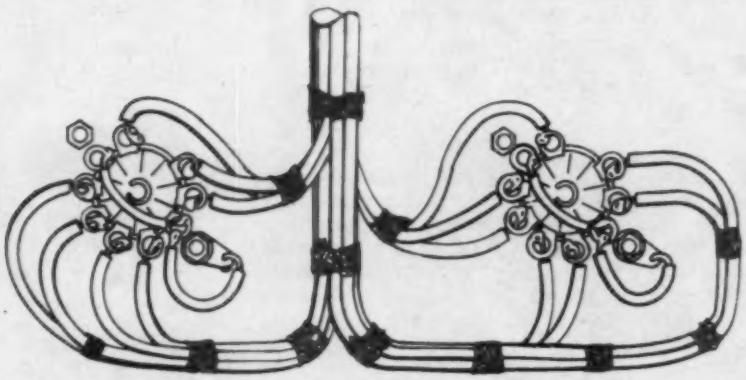
(Continued on next page)



Lock stitches bind harness together to prevent sliding and shifting. Stitches should be tight, but not so dense they obscure color coding



Unacceptable Wire Routing



Acceptable Wire Routing

Good wire routing prevents (1) poor tie, (2) insulation chafe, (3) ground through wire instead of a lug, (4) insulation chafe, (5) jumper without sleeve, (6) splice, (7) poor bundling, (8) insufficient wire wrap, (9) insulation in terminal hole (10) long wire, (11) excessive stripping, (12) taut wire, and (13) bare ground wire

A final check

Soldered joints should be checked carefully, but never with a technique that could damage the wire or insulation. Periodic checks should be made to see that the proper fluxes are being used. Here's a good general check list:

1. Check for inadequate wire wrap (¾ to 1 turn necessary).
2. Check for insufficient solder at wire termination.
3. Check for excess solder on terminal.
4. Check for cold solder joint.
5. Check for rosin joint.
6. Check for insulation in connection.
7. Check for excessive projection of bare wire between insulation and terminal (⅛-in. maximum unless noted).
8. Check for solder short.
9. Check for solder prong. •

Reprints

of this special report are available at 25¢ each (less for quantities over 100) from Reader Service Dept,

AM/MM

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Sub Surface to Outer Space

Under or on the surface of the earth, in the air or in outer space, screw threads are vital to man's ability to live, move or work. Strip his inventions of screw threads and he would return to a village handicraft existence. Yes, it would be hard to overstate the importance of screw threads in our modern world, and equally hard to imagine generating internal screw threads efficiently without taps. If you use either standard or specially designed taps for products on which men's very lives depend, can you afford to use any but the best?

USE TAPS WITH CONFIDENCE, USE GREENFIELD TAPS **GREENFIELD TAP & DIE** GREENFIELD, MASS.

FASTENOMICS

TIPS ON FASTENER APPLICATIONS BY **STANSCREW**

Socket Screw Standards Changed

Check Dimensional Revisions Now to Avoid Extra Costs

Important changes are now in progress in the socket screw industry. Every user should know the details and take appropriate action to avoid higher costs in the future. As a public service, Stanscrew is issuing this progress report.

New Standards Adopted

Exhaustive industry-wide studies, begun in 1954, culminated in 1959 with the adoption of new dimensional standards for socket head cap screws. Standard Screw participated in these studies and concurred in industry recommendations. The new standards, known as the "1960 Series", include changes in head diameters, socket sizes, and thread lengths.

Advantages of New Design

The "1960 Series" has been carefully engineered so there is functional uniformity for all sizes, particularly as applied to wrenching areas and to the relationship of head diameters to body diameters. It offers these important advantages over the previous design, known as the "1936 Series":

1. Larger wrenching area permits applications of clamping force . . . provides maximum utilization of fastener's inherent strength.
2. Provides increased bearing surface under the head . . . up to 233% more.
3. Minimum indentation . . . particularly important with softer metals.

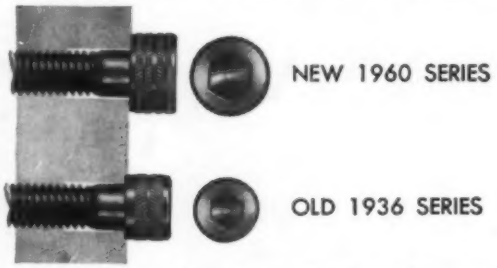
What's Available When

When the "1960 Series" was announced in 1959, it was believed it would become the only standard as of Jan. 1, 1961 and, thereafter, all "1936 Series" would be available only on special order. As previously announced, all sizes in the "1960 Series" are being supplied as standard. However, to make the transition as easy as possible, Stanscrew and other leading producers have extended the changeover period for certain sizes of the "1936 Series".

These are the sizes . . . 5/16", 7/16", 5/8", 3/4", 7/8" and 1" . . . for which the new standards include a change both in head diameter and socket width across flats. Until Jan. 1, 1963 both the "1936 Series" and "1960 Series" will be considered standard in these six sizes.

For all sizes, however, thread lengths are now being manufactured to "1960" standards. Once current inventories are depleted, "1936 Series" thread lengths will be available on special order only. Based on exhaustive surveys, this will prove no problem in the overwhelming majority of applications.

In some sizes . . . #1, #2, #4, #6, and #8 . . . head diameters are the same, but there has been a change in the socket width. In these sizes, current production is to "1960 Series" dimensions. These sizes are also available in the "1936 Series" until present stocks are depleted, but thereafter only on special order.



Change In Your Designs Essential

This industry program makes it essential that you review product designs to avoid future difficulties. All products now on your drawing boards should incorporate the "1960 Series" socket cap screws wherever possible. And, during the next two years, it is recommended you take advantage of model changes or other opportunities to change existing applications of the "1936 Series" to the "1960" standards. Failure to make provisions could result in procurement difficulties or the higher costs of non-standard items.

Complete Design Information Available

Stanscrew has prepared an up-to-date brochure giving complete information on all steps in this important transition, together with complete design data on both the "1960" and "1936 Series". You can obtain your copy through your local Stanscrew distributor. Call him today.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

Screw Machine Work on Aluminum – VII

By M Bryan Baker, Kaiser Aluminum & Chemical Corp, Oakland, Calif

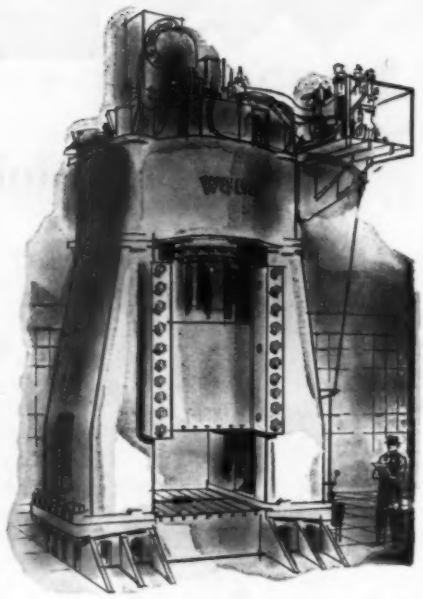
Trouble Chart for Threading

Possible Causes	Corrections
Damaged Chasers	
Dull chasers; chaser touching shoulder; loose fits at corner, alignment; loose front plate; high feed; poorly designed cams; too small a die for the job	Sharpen to recommended angles (see below). Check alignment with correct-size blank; close-tolerance blank diameter must have slightly chamfered edge for proper starting. Obtain rigidity in components, tighten front plate. Speed should be adjusted. Provide ample clearance for chip movement. Initial damage to chasers is sometimes due to faulty cams; especially check entry; try larger die if available or smaller-size stock when possible
Rough Threads	
Dull chaser, poor grind, wrong clearance or chamfer angles; defective diehead; misalignment; chasers hitting shoulder, improper position in diehead; improper feed; chip packing; coolant inadequate; chamfer undersize; blank too large; speed or feed too high	Resharpen at first signs of dulling. Circular chasers should have a face angle of 20° to 25°, clearance of 10°, a top rake of 25° and a chamfer angle of 20° to 22°. Tangent chasers have a top rake of 30°, lip hook of 5° to 10° and a chamfer angle to 20° to 22°. Starting ends of lands can be chamfered to about 30° for the first 3 or 4 teeth, which do most of the cutting. An angle of 8° to 10° should be ground on the face to give side rake. Check for proper positioning, shoulder contact. Provide adequate coolant-lubricant to avoid heating, buildup or chip packing. Provide more chamfer on part to be threaded, try smaller blank. Blank size will depend upon accuracy needed (see "Pitch Variation"); try speeds under 200 sfpm, especially if swing holder is used (see "Tapered" Threads"). Feeds include about 0.0005 ipr for ⅜ in. root dia of blank at 14 threads per in.
Tapered Threads	
Defective chasers, dieheads or start; alignment; feed variation; bad camming; bent diehead shank; chasers loose in diehead; improper speed	Check sharpening, clearances, positioning and start of cut, alignment and feed. Although dies are generally self-leading, it is sometimes advisable to control the longitudinal movement. For 9 through 14 pitch, 200-250 sfpm is nominal, 14 to 18 requires 325 sfpm and 18 or finer, 475 sfpm
Pitch Variation	
Foreign matter in diehead; worn loose locking pin or binding screw; blank size too large or too small; threads off lead	Use air hose and/or brush and cleaner to clean diehead. Check for play in locking pin and binding screw. Experiment with different blank sizes. When thread rolling, there are three classes of blank size —for ¼ to ½ in., blanks are 0.002 to 0.0025 in. larger than pitch diameter; for ½ to 1 in., blanks are 0.0025 to 0.003 in. larger; those from ¼ to ½ in., with comparatively free fit, can vary from 0.002 to 0.003 undersize; above ½ in., 0.003 to 0.005 in. undersize; those smaller than ¼ in., from 0.001 to 0.0015 under pitch diameter. Start chamfer below root of chaser teeth, averaging approximately 22° for straight cutting by circular tangent chasers. For close-to-shoulder work use shorter chamfer of about 45°. Be sure all chasers are ground to begin cutting at same time

Continued on page 111

Treat 'em rough,
These Wood Valves can take it.

Presses take a beating? No need to worry about the effect on your hydraulic system if Wood Valves are at work. They're built to handle the toughest jobs. For example, this 3"x1½" special main control valve is installed on a 1500 ton forging press. Operating conditions demand extremes in acceleration and deceleration, yet the valve assures shock-free, efficient service due to its inverse flow design. Control of the ram is precise, accurate . . . with shockless decompression. You can also see a fully balanced throttle valve and a 3"x7" shock alleviator, further examples of Wood's complete line of quality high-pressure valves. Write today for complete information.



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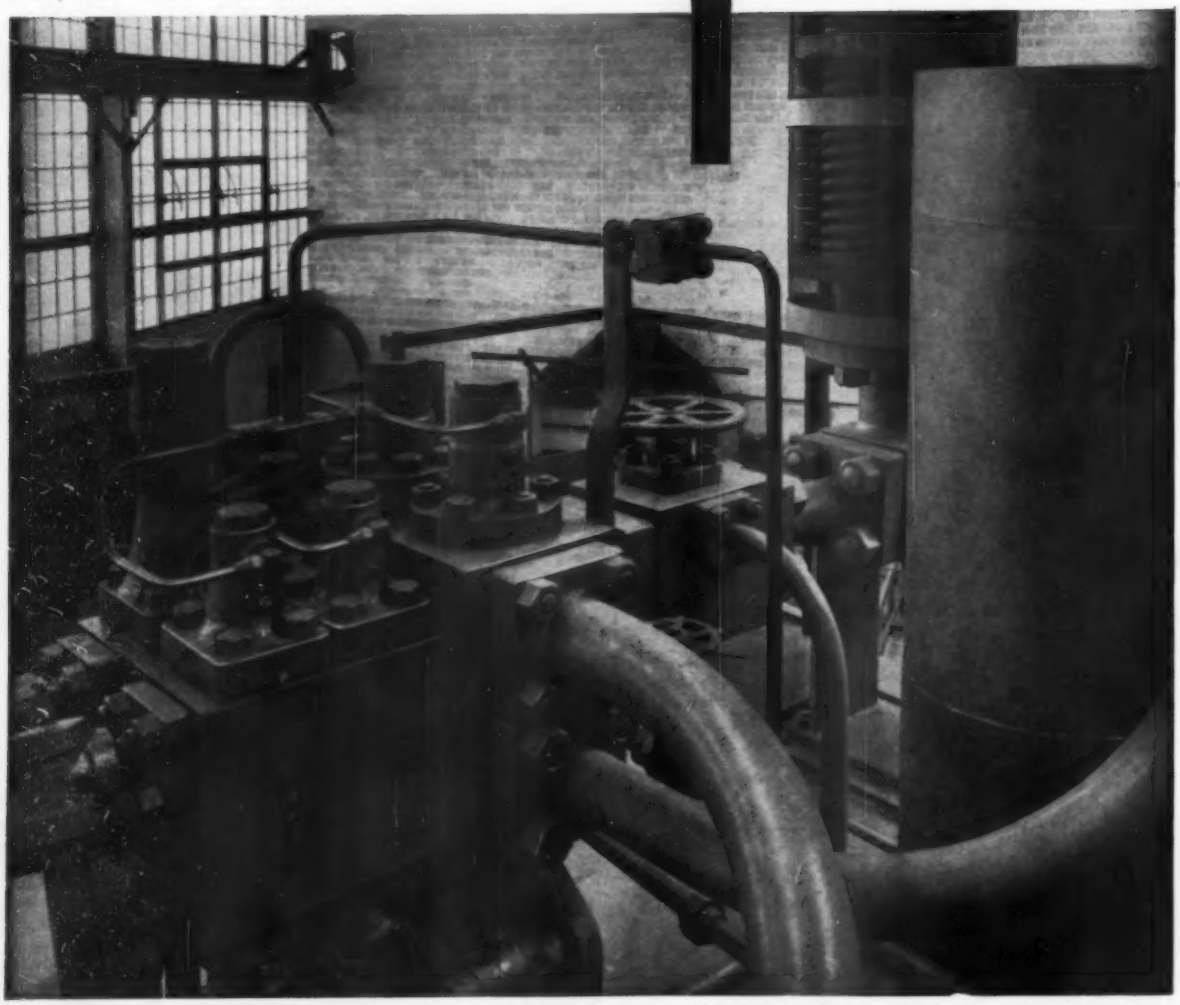
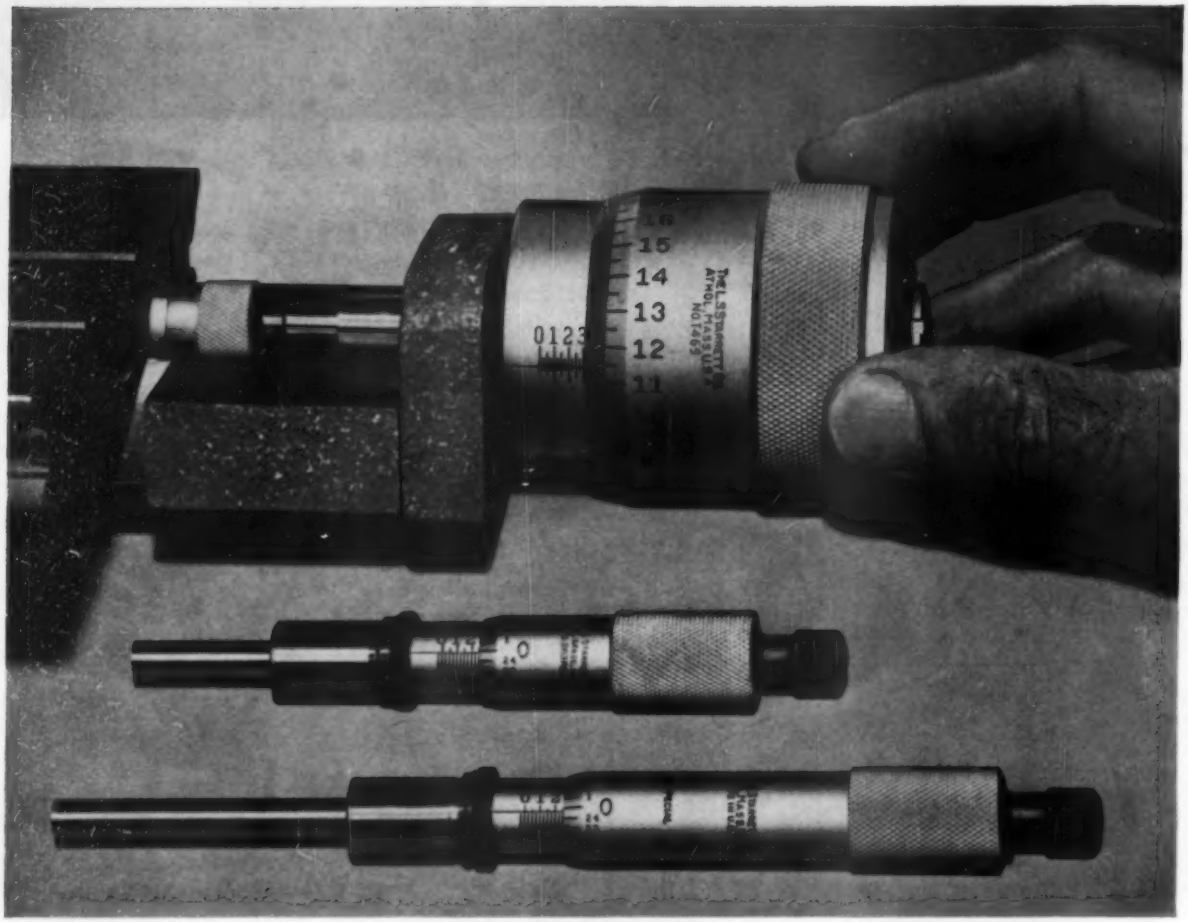


Screw Machine Work on Aluminum – VIII

Trouble Chart for Skiving

Possible Causes	Corrections
	Breakage of Tool Edge
Angle too sharp; metal build-up; improper cooling of cutting edge; poor tool support	Grind skive tool to recommended angle for work (end cutting edge angle 10° to 35°, front relief about 15°); provide coolant that has lubricating quality; check toolholder and tool overhang
	Breakage of Work
Feed too great; approach angle too shallow; support of work poor; work extends too far from collet; tool digs in; skive tool not set properly	Check feed, (depends on approach angle, support); reduce approach speed; increase approach angle of skive tool; check tool approach angle; examine cross-slide for looseness
	Chatter and Poor Finish
Work improperly supported, tool dull; rake and approach angle incorrect; edge build-up; stringy chips between cutter and work; machine loose, excessive skive tool overhang	Support work and tool for greater rigidity; sharpen cutter. Increase rake and/or reduce approach angle (see below). Arrange for proper chip breaking. Check clearances between work and cutter; examine lubricant. Be sure machine is tight, tool is held firmly and that slides for other operations are tight. Avoid excessive overhang
	Work Undersize, Oversize or Eccentric
Approach angle wrong, lack of support; non-rigid tool; defective tool; machine spindle and slides loose; wrong speed, feed	Most approach angles vary from 15° to 20° except where pressure is unlikely to cause bending, as in the case of large diameters; here smaller approach angles are used. Check angles, sharpness of cutter. Make certain machine spindle bearings, as well as slide-bearing surfaces, are snug. Recheck machine feeds, speeds. Usual practice is 700 to 1100 sfpm for round, 450 to 550 sfpm for hexagonal and 300 to 350 for square work. For alloys with poor machinability, these figures should be reduced approximately 250 to 550 sfpm for round, 100 to 150 sfpm for hexagonal, and about 50 sfpm for square work. For unsupported stock, ratio of length to smallest turned diameter is 8 to 10 to 1. For stock under ⅜ in., feed will average 0.002 ipr with a 0.150 in. depth of cut; with 0.004 in. feed, depth of cut will approach 0.125 in.



PRECISION TOOLS — No. T465 SATIN-CHROME 0-1" Micrometer Head with 2½" thimble, 9/16" x 1" dia. clamping surface, tenth graduations; No. 263RL 0-1" and No. 63RL 0-2" Micrometer Heads, both with ⅜" x ½" dia. clamping surface.

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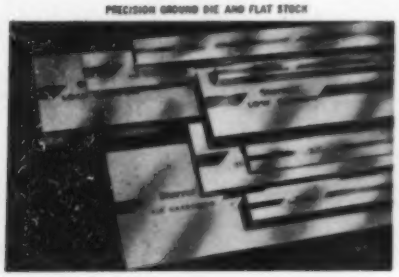
Starrett is the logical source for micrometer heads for mechanical or electronic applications. As with many other fine Starrett tools and gages, they are available in a wide choice of standard models or with special variations from standard to suit your exact requirements. Available through your nearby Industrial Supply Distributor or for special heads through the Starrett Special Order Department. Call him or write for complete Catalog No. 27. Address Dept. D, The L. S. Starrett Company, Athol, Massachusetts, U.S.A.

World's Greatest Toolmakers

PRECISION GROUND DIE AND FLAT STOCK



HACKSAWS, HOLE SAWS, BAND SAWS, BAND KNIVES

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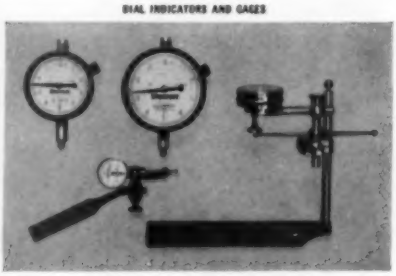
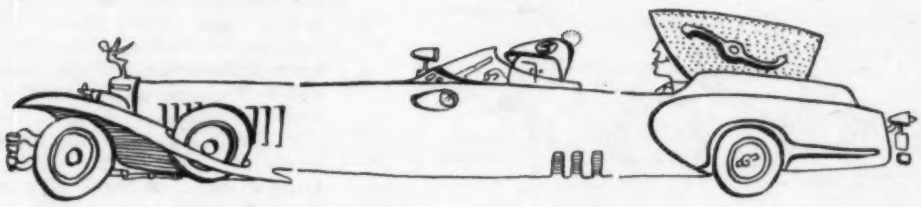


Talking Shop



Design Your Own

GREAT FUN is being had with a booklet published by U S Steel that permits you to design your own car. It is called "Designing Made Real Easy by Using U S Steel." The booklet has split pages that permit you to put together combinations to challenge your wildest dreams. (Incidentally, the booklet includes a review of the types of steel available for autos and their application.) At the top of the page you see our favorite combination, though it probably wouldn't be as practical as the standard car we are now driving.

Paris Calling

AN INFORMATION CENTER of industrial techniques is in operation in Paris. Reported to be a non-profit organization, it is seeking catalogs and bulletins from manufacturers of equipment. The center asks for "complete, detailed catalogs." If you have any material you would like to offer to this library, we suggest you send it to: Centre D'Information des Techniques Industrielles, 35 Rue D'Amsterdam, Paris 8e, France.

Donation

SPEAKING OF LIBRARIES, we've just learned that the University of Southern California has just received a gift of a complete set of copies of back issues of AM and AM/MM for the period from 1940 to date. This gift of 21 years of this magazine was made by Joseph N Goesche, an executive of the Douglas Aircraft Co.

That period of time just about goes back to two important developments at Douglas that were first reported in AMERICAN MACHINIST—the Guerin process of forming and the inert-gas-shielded-tungsten-arc welding method developed for aluminum and known to most people today as Tig welding. Many other important developments from many companies are reported in this period and we are sure that students of manufacturing at USC will find the back issues useful and be grateful to Mr Goesche for the gift. We, too, have a personal file of back issues, extending almost as far back, and we wonder how he found room.

Form-Relief Workshop

A THREE-DAY WORKSHOP on the techniques of form-relief grinding was held in Cleveland recently. There was general information on cutter theory and grinding-wheel selection, but the conference centered on the actual techniques of grinding tap chamfers, chip drivers, reamers, step drills, long pilots, gun drills, countersinks, mills, and bottom drills.

William Johnson and Ray Nixon of R-O Manufacturing Co conducted the conference, an outgrowth of a training program that is offered at the R-O plant in Royal Oak, Mich. This is the first of a planned series of conferences in other cities. If you are interested in knowing about a conference if it is scheduled in your area, circle item 50 on the Readers Service Card and we will pass your query along to R-O.

Fine Polish

WHILE BROWSING through an old (1912) book the other day, we came across a strong recommendation for "oilstone powder" as a polishing medium. We were rather amused, and figured that, in these enlightened days of high-grade manufactured abrasives, the old-fashioned stuff must have been abandoned long ago. But that set us to wondering what became of the great amount of waste that there must be when natural oilstone is dressed to commercial shapes. Just for laughs, we asked the people at Behr-Manning, and learned that crushed Arkansas stone is still sold in substantial quantities to watchmakers. It is labeled "Silkite powder where high polish or finish without scratching is required."

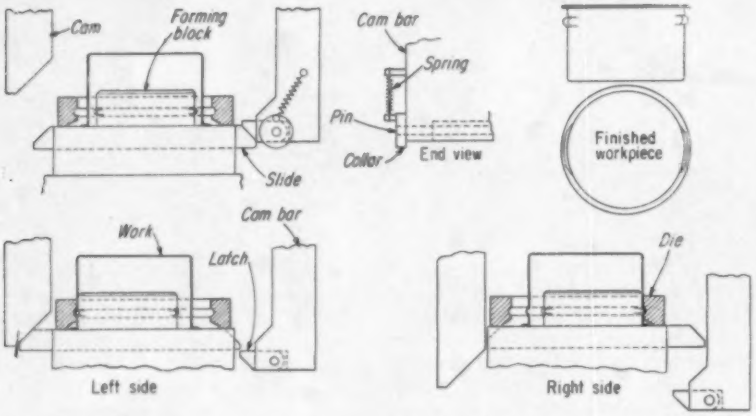
Sorting Refractory Metals

WHEN PARTS OR SCRAP material of molybdenum, tungsten, beryllium copper, and nickel alloys need to be separated into different groups, there are several quick checks that help to distinguish them. Placed in a bath of mercury, tungsten sinks, all the others float. In a bath of molten Wood's metal, molybdenum will float, the others, except tungsten will sink. Checked with a strong permanent magnet, molybdenum and beryllium copper will show no magnetism. Monel will be slightly magnetic at room temperature, but will lose its magnetic properties when heated to the temperature of boiling water.

Another check for molybdenum involves placing a drop of 1:5 nitric acid containing 10% by vol of phosphoric acid on a clean surface. A chocolate-brown spot will develop immediately on molybdenum. A spot test of concentrated nitric acid on cleaned work will not affect moly or tungsten, but the other metals will show a cloudy green or blue color. To differentiate between molybdenum and tungsten, dip cleaned specimens in hot dilute nitric acid (66% by vol). Moly will show a dark brown stain; tungsten will not be affected. Or a mixture of ten parts of hot hydrochloric acid and one part nitric acid may be used. Moly will react violently; tungsten will not be affected. •

Practical Ideas

Side-Action Die Forms External Beads



One press stroke makes this die move left, then right to produce outside beads below the top flange of a cup. The parts were required to carry a chemical mixture through a furnace, and each cup had to be beaded so it would nest in a conveyor (on the beads) but leave space under the flange so they can be picked off the conveyor by a forked bar.

The beads are like ears, opposite each other, and at the same height. A forming block reciprocates under the inverted workpiece, which is held in a ring die, as two cam bars come down with the press ram.

The formed ring die is attached to the die base, but between them works a slide with beveled ends. First action occurs when the right-hand cam bar pushes the slide left; after the cam clears and as the ram continues down, the left-hand cam forced the slide right. A spring arrangement on the right-side cam block allows the right-hand cam to clear the work as the press ram goes back up.

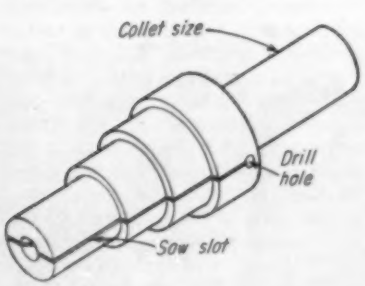
No work clamp is provided because the part stays in place—and is easily loaded and unloaded when the forming block is recentered after the press stroke. Undercuts in the ring die admit the flange on the work.

The right-hand cam is actually a latch to which is pinned a collar that is held up by the spring. This allows the latch to pivot as the ram rises, and snaps it back into working position when it has cleared the slide.

The beads are formed to full depth at their centers, but taper off toward both ends to reduce strain in the cup material. The forming block is not completely circular because only the area around the bead is being formed.

L Kasper, Philadelphia

Multiple-Step Mandrel Makes Quick Setups



Tooling for short-run machine work has to be simple, cheap, but useful for many jobs. This multiple-step mandrel is handy for gripping many parts internally—and it can be made in any sizes that might come through your shop.

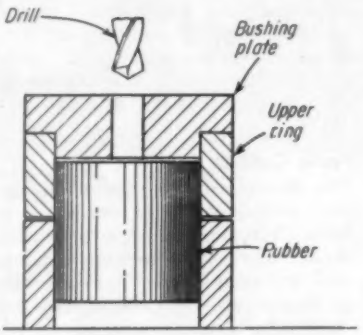
Aluminum bar is chucked and turned at one end to fit a large standard collet size. Then you unchuck the work and drill a saw-relief hole as shown. Bandsaw a slot to the hole.

Now soft-shim the slot, face off the slotted end, and centerdrill. With the shim still in place and the work still chucked on the collet diameter, bring in a live center under light pressure and turn the required steps. These should all be right on the nominal dimensions you have picked, because the mandrel will be expanded to those diameters when operating.

To set up a part for ID chucking, locate the work on the right step, bring in the live center with sufficient end force to expand the mandrel so it grips the work, and start your machining.

These steps may be only a few thousandths apart in diameter, or may be bigger jumps, if required. We use aluminum as a mandrel material because fabricating time is short and we know it will pay for itself on just a few short runs.

Norman Fried, Los Angeles



Rubber Drilling Jig Confines Work for Accuracy

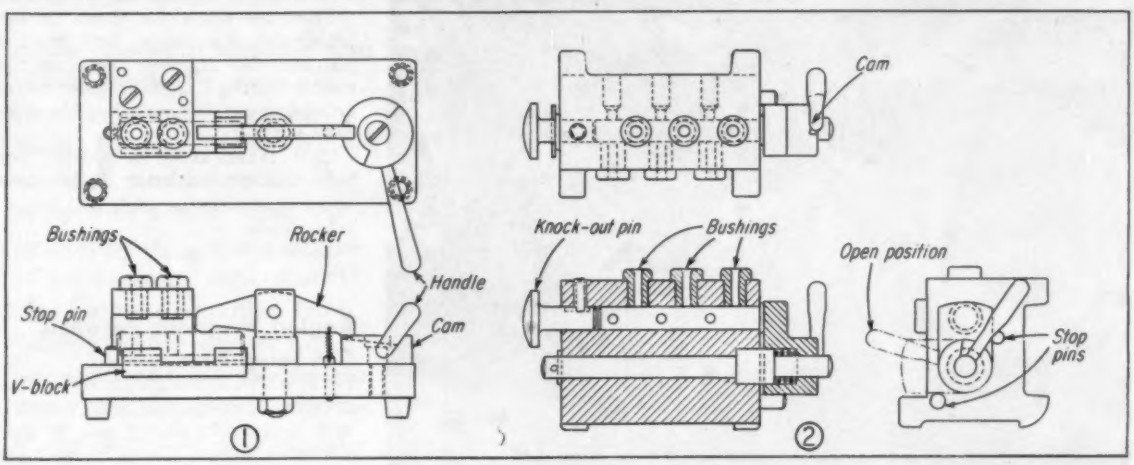
We had to enlarge the center holes through some rubber rollers, but found that holding them by hand distorted them and produced a non-round hole. We solved the accuracy problem by making a fixture from tubing.

We made a two-part cylinder with a cap drilled to pass the tool. These were a snug fit for the ¾-in. OD of the rollers. An ordinary drill running at high speed cut the holes 1 in. deep, opening them from ⅛ to ¼ in.

Two separate rings made loading easier. The bushing was shouldered to insert in the top ring. With water coolant, the job went well and the work came out within the required ±1/64-in. tolerance.

Hugh Monaghan, Bronx, N Y

Two Quick-Clamping Drill Jigs Position Small Steel Shafts



These fixtures have fast-acting clamps that allow high production and minimum lockup time for small shafts. The first one (1) is for drilling two holes through the centerline of the work; the second one (2) is for drilling two sets of three holes each at 90° to each other. Both use inclined-face cams for quick twist-of-wrist operation.

1. This is basically a V-block on a flat fixture plate, with two drill bushings mounted over the work on an overhanging block. The work is easily dropped into the V-block, then extracted by hand after drilling. A small stop pin at the left positions each part accurately; the clamping rocker grips the part to prevent endwise motion or rotation.

The lever is integral with a cam that works under the spring-loaded end of the rocker—the spring opens the rocker when cam pressure is released. Cam action is fast—as fast as necessary because the cam slope can be cut to any desired rise. More clearance can be built in by cutting the cam face, at "open" position, deeper than shown.

2. This is a completely-enclosing jig with three drill bushings each on two faces of the fixture block. With the lock block at the right end out of the way, a part is loaded against the knock-out pin at left—exact location controlled by a stop screw whose end rides in a slot in the knock-out pin. Work is ejected by rapping this pin, which kicks the work back out of the hole.

The handle moves the lock block out of the way, or back into locking position. Normally the spring inside the lock block keeps the block backed up against the handle. However, as the operator closes the handle, the lock block contacts a stop pin (see end view) that stops motion. Then, further handle motion makes the handle ride up a cam section on the lock block, which forces the block hard against the end of the workpiece, locking it in position.

As the fixture is unloaded, the system works in reverse to relieve end pressure on the work, then clear the lock block away from the end of the hole.

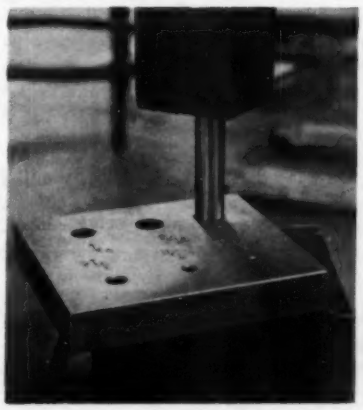
Both fixtures work rapidly with short lever action; both also grip the work positively with high pressure that prevents work shifting as the drills start cutting.

A Hjalmar Dahl, Upplands Vasby, Sweden

Dowel Guide Improves Assembly

This is a minor refinement that may seem a lot of trouble for nothing, but an experinenced toolmaker knows that one dowel pin cocked during die assembly can completely ruin a careful and expensive job.

The dowel guide is a piece of ground flat stock ½ in. thick and 3 x 3 in. It is drilled to produce slip-fit holes for the most common sizes of dowels. The holes are carefully drilled exactly perpendicular to the bottom face of the block, then deburred all around, both ends. We



stamp the hole sizes on the block to simplify choice. The block won't need hardening unless unusually severe service is expected.

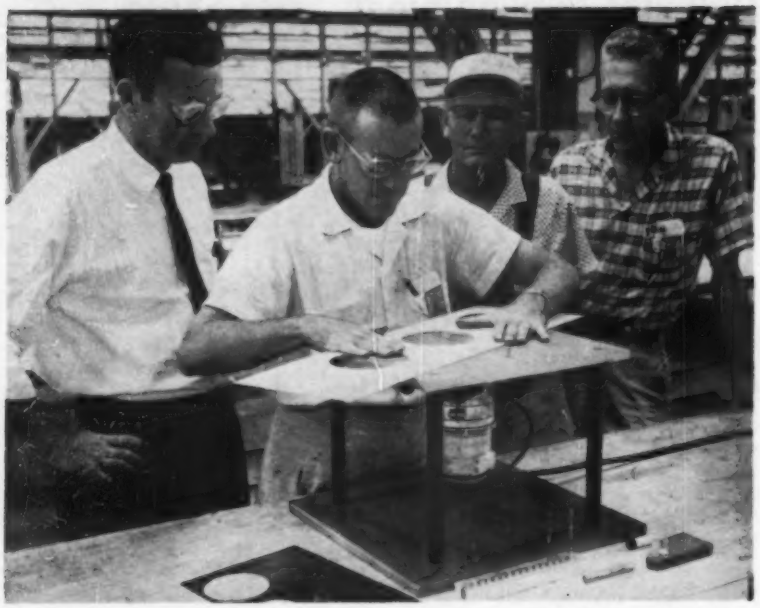
It works this way: Place the guide with the proper hole over a hole in the work into which a dowel must be fitted. Slip the dowel into the guide and into the work hole, then tap down farther with a hammer or use an arbor press. Finally, remove the guide and finish seating the dowel.

This system works for our best assembly, even that requiring accuracy to tenths.

Norman Fried, Los Angeles

Practical Ideas

Router Cuts Round Templet Holes



Our templet shop now cuts round holes in sheet-metal templets on a router, saving about four minutes per hole, doing a better job, and eliminating the old trouble with breaking and rewelding a bandsaw blade each time. The machine is a hand router mounted under a short bench table and fitted with fixturing that controls the diameter of the hole being cut.

First we pre-punch a hole at the circle center and one on the diameter with duplicator bars that produce standard templet-lightening holes at spacings up to 15 in. in ½-in. increments. For any radius in between, an adjustable sliding bar is required.

Then we place the stock on the table with the center hole over a pin and the diameter hole on the router cutter. Guiding the metal around to cut a complete circle is an easy job.

This takes about a minute per hole; the old bandsaw system took about 5 minutes per hole and wasn't as accurate.

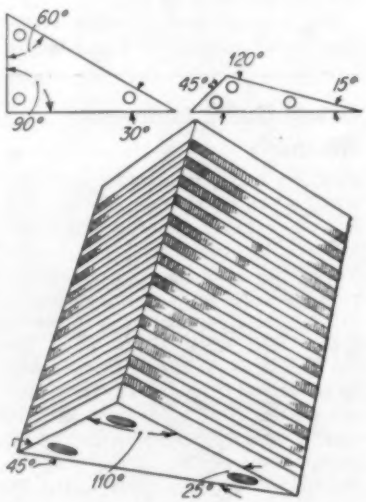
Lockheed Aircraft Co, Marietta, Ga

Angled Magnetic Parallels Cut Setup Time

For much of the work in our surface grinder, a set of magnetic parallels such as the ones shown save us considerable bother. Normally, we'd use a sine plate or tilting vise to set up a piece for grinding an angle or bevel. But, though valuable these accessories are, they add height to reduce the grinder capacity and they do require a certain amount of time to arrange and apply.

Not so with angled magnetic parallels where standard angles are concerned, that is, standard to the extent that they are made to suit a particular need or to combinations of which a few are suggested in the sketch. We have made ours in pairs so long pieces may be rigidly supported but, very often, one parallel is enough.

George W Meyers, Philadelphia, Pa



M W Loftus
Chicago, Ill
Won $25 for his idea

Shaper Cuts Oil Grooves
in the Nov 14, 1960 issue

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning idea is made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors, without reservations or bias, as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc., and those of its advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

Alfred V Bodine

at 66 follows a schedule that would knock the props out from under men years his junior. He not only runs a topnotch machine tool company with a firm hand, but finds time for literally dozens of professional, civic, church and business activities. From Sunday School teacher to president of the National Machine Tool Builders to chairman of the Board of Trustees of the University of Bridgeport, it's always been a case of . . .

"Bo" on the go

"Bodine" might be called a household word in metalworking. It describes the Bodine Automatic Dial Type Multiple Spindle Drilling, Tapping, Milling, Screw Inserting and/or Assembly Machine — so much of a mouthful that even its manufacturer, Alfred VanSant Bodine of Bridgeport, Conn, sometimes has trouble getting it out.

"I like to think," says Bodine, "that every time somebody switches on a light or drives an auto he touches something made on a Bodine machine."

For 27 years, Bodine has been a busy man, shepherding the growth of a shop he bought in the midst of the depression. Yet along the way he has given unstintingly of his time — and, one suspects, money, although he'd be the last to say so — to civic improvement in his adopted town of Bridgeport and his adopted state of Connecticut.

"Bo" is internationally known for his unflagging efforts on behalf of the U S machine tool industry, but to expose a completely different side of his many-faceted personality, he is equally well known to the young people of Bridgeport, many of whom he has helped directly and indirectly through his work with the YMCA, Boys Clubs of America, and the University of Bridgeport.

Few men have had as many civic and industrial honors showered upon them as has Alfred Bodine. His presidencies alone include those of the National Machine Tool Builders Association (1956-57), Manufacturers Association of Connecticut (two terms), of Bridgeport's Rotary and Algonquin Clubs, Connecticut Motor Club, and four consecutive terms as president of the Bridgeport Chamber of Commerce.

Officeholder extraordinaire

The complete list of offices held by Bodine is staggering. A few others: director, National Association of Manufacturers; vice president, Connecticut Chamber of Commerce; director, National Industrial Conference Board; chairman, Board of Trustees of the University of Bridgeport; trustee, Lehigh University (his alma mater); vice president, Connecticut Development Credit Corp; and director of the Bridgeport and International YMCAs, Bridgeport Boys Clubs, and the Boys Clubs of America.

"I've always been over my head in civic work. Why?," Bodine shrugs, "Dunno, guess it's just because I like that sort of thing."

Do all these outside activities cut into his work as president and treasurer of Bodine Corp? Not at all. Wherever he goes, his Gal Friday, Ellen Hedegaard Topham ("I inherited her in 1919, couldn't run the business without her") knows exactly where to get in touch with him. Anyway, when he goes on a trip he leaves the business in other capable Bodine hands, those of sons Edward and Richard, both of them vice presidents.

Edward and Richard, incidentally, were fighter pilots in World War II. Their older brother, Alfred, Jr, a B-17 pilot, was killed in action over Vienna. Their sister, Betty, inherits her father's penchant for civic and church work.

Today a New England Yankee by

adoption and conviction, Bodine was born in 1894 in Lambertville, N J, a picturesque little town on the banks of the Delaware, "In the days when drunken boatmen cussed their way down the Delaware Canal."

Graduating from Lambertville High in 1911 as president of his class, Bodine worked his way through Lehigh University, wound up with a mechanical engineering degree. He has in the years since become one of Lehigh's most honored sons, receiving an honorary degree of Doctor of Engineering in 1946 "in recognition of his outstanding leadership in his professional work and in the life of the community." He is today a trustee of the University.

After only two years on his first job, with Winchester Repeating Arms Co at New Haven, Conn, Bodine became Superintendent of Watervliet Arsenal. At World War I's end, he became a consulant for Hunter Arms Co, Fulton, N Y, maker of L C Smith guns. His love for guns, incidentally, has never left him—"I must have about 20 handguns alone, plus seven shotguns, and 15 rifles. No antiques for me. These are all the most modern I can get. I like to shoot them, not just look at them on the wall."

Same secretary for 42 years

In 1919 Bodine came to Bridgeport as works manager for Columbia Graphophone (where he "inherited" his secretary Ellen Topham), which later sold out to Dictaphone Corp, of which he became a vice president. In 1928 Bodine joined Raybestos-Manhattan Inc as assistant to the president.

Five years later in the depths of the depression, Bodine, never a man afraid to take chances (He and some fellow Bridgeporters once took a flyer on a new movie sound-colorfilm process, would have really hit the jackpot if a similar process hadn't nosed them out by inches), gave up his lucrative job to acquire the defunct Anderson Die Machine Co.

With the Anderson company came manufacturing rights to a dial machine, forerunner of the present "Bodine."

"You'd never recognize it today, though," Bodine says. "Anderson's trouble was that he never built two alike. Now every machine we put out is standardized."

After a slow beginning ("Nobody, but nobody, was buying machine tools during the early days of the depression. I couldn't get 5000 bucks without a mess of co-signers"), Bodine machines began to catch on and the company was ready to expand by 1936. The company bought out Springfield Manufacturing Co of Bridgeport and moved to its present location. Since then, Bodine Co has more than doubled its floor space and has at least quadrupled its output.

For 30 years, Bodine has been a member of the Aspetuck Fish & Game Club, which provides him with his chief recreation. He is a devotee of rod and gun—has never played golf.

"Herbert Hoover has come there to fish more than once. I got to know him pretty well through that and through my work with the Boy's Clubs. He's honorary national chairman, you know."

Politically, Bodine has an even closer bond with Hoover, is a conservative in the traditional New England mold, believing, as he put it, in "a sound day's work for a sound dollar." He believes too, though, that if Bodine makes money, its 100-or-so workers should make money, too, and they are the recipients of a generous profit-sharing plan.

"Nobody *ever* leaves the company," Bodine says proudly.

Of course, that's not literally true, people *do* leave Bodine because of retirement, death, and other causes of natural attrition. And the company, like other machine tool builders, is feeling the pinch these days. For this reason, the workforce currently numbers around 100 people, rather than a normal 125 or so, because the firm isn't replacing them until business looks up.

And Bodine doesn't think the machine tool business will really get going again until the government adopts a realistic attitude toward depreciation and taxes in general. "Then," he says, "plants could replace outworn machinery, and this would pump new blood into the machine tool industry. But every Congress for the last 10 years has promised to do something about it and has shied off. I just can't see what the objection is. The government would get the same amount of tax money, but it would take a little longer, that's all."

In speeches across the country, he has also sounded the tocsin against growing foreign competition. "Frankly," he says in private, "I'm not sure what to do about it myself. One thing we've got to do is get prices down without losing the quality for which the American machine tool industry is famous. Probably the best way to do this is to practice what we preach — modernization, mechanization, automation, standardization—call it what you will."

Fight for world markets

The Bodine Co has managed to give foreign competition a run for its money on its home grounds by building Bodines under license in England. "We build them solely for the European, and sometimes the Australian, market. Wouldn't dream of shipping them back here. I don't think any American builder does that. But by building our machines in England we can keep our sales prices down in Europe and achieve an acceptance that would be totally denied us if we had to sell at U S prices."

All-out mechanization of U S industry is inevitable, Bodine feels, simply because the population is growing faster than the workforce.

"By 1975," he says, "a metalworking labor force of only 15 million will have to produce goods for 230 million people, and the only way it can do it is with automated equipment. Some people will be thrown out of work, sure, in the early stages of transition. But eventually they will get better, less-menial jobs and they will enjoy a higher living standard. It means that products will be better and production costs lower." •

Gleason Works, Rochester, NY, has formed major new manufacturing divisions within the organization. **Edgar W Blick** has been named manager of the Foundry and Metallurgy Division which includes foundry and sheet metal, heat treat, and plating departments. **Alfred J Murrer,** assistant factory manager, will direct the Machine Division which combines all machining and assembly departments concerned with Gleason machines. **Donald L Whitmore** will head up the Arbor, Cutter, and Gear Division. He has been manager of Gleason Works Ltd in Watford, England. **Arthur G Matthies** has been named chief industrial engineer to direct the Industrial Engineering Division which covers time standards, costs estimating, methods, tool design, and tool manufacturing activities.

Yale & Towne Manufacturing Co has elected **Paul R Hartig** vice president and general manager of the Yale Materials Handling Division, Philadelphia. Prior to joining the organization, Mr Hartig served as general manager of General Electric Co's Insulator Department at Baltimore.

Jones & Lamson Machine Co, Springfield, Vt, has named **Holmes H Whitmore** president and chief executive officer. Associated with the organization since 1941, Mr Whitmore has been executive vice president since 1955

Norton Co, Worcester, Mass, has elected **Ralph F Gow** (left) president. **Milton P Higgins** (right), president since 1946, has been named chairman of the board to succeed **George N Jeppson** who will remain on the board as honorary chairman. **John Jeppson,** formerly general manager of the abrasive division, and director of manufacturing, has been elected executive vice president to succeed Mr Gow

Allis-Chalmers Manufacturing Co has named **John V McGuire** general manager of the Pittsburgh Works. Formerly assistant general manager, he succeeds **D A Griffith** who has asked to be relieved. Mr Griffith has been appointed purchasing agent.

General Motors has named **Robert L Kessler** general manufacturing manager at Buick. He succeeds **Donald F Taylor,** named manager of production control and purchasing. **Perry W House** replaces Mr Kessler as works manager of the Delco-Remy Division. Formerly manufacturing manager for the Division's ten Anderson (Ind) plants, he is succeeded in that post by **J Stewart Garlic. Harold H Miller** has been promoted from foundry superintendent to general superintendent in charge of Buick engine plant and foundry operations. **Richard G Carter** has been appointed director of tool and process engineering for the Buick-Oldsmobile-Pontiac Asesmbly Division to succeed **Leon H Stermer** who has retired. Mr Carter has been general superintendent at the B-O-P plant in South Gate, Calif.

Dana Corp, Toledo, has appointed **J R Miller** group vice president in charge of manufacturing, engineering, and industrial relations. He has been vice president, manufacturing for the past six years. He is succeeded in that post by **E M Douglas,** formerly vice president, engineering. **P J Mazziotti,** director of research and development, has been named director of engineering.

Machinery Sales Co, Los Angeles machine tool distributor, has elected **Howard T Christanson** president. **Nathan Troop** has been named vice president and treasurer and **Kimball Smith** vice president and secretary.

Producto Machine Co, Bridgeport, Conn, has appointed **Sheldon Saslawsky** manager of the Plastics Machinery Division. He was formerly chief engineer at Auto Vac Co.

Moore Special Tool Co, Bridgeport, Conn, has named **George M Lamb** sales manager. Formerly sales engineer in New Engand, he succeeds **Edward Shaw Jr,** retired.

Sperry-Rand Corp has named **J C Hydrick** assistant general manager of the **Wright Machinery Co Division** at Durham, NC. Mr Hydrick was formerly vice president and general manager of the Disston Division of H K Porter Co, Philadelphia.

Pressed Metal Institute, headquartered in Cleveland, has appointed **Jefferson D Keith** managing director.

(Continued on page 170)

Hydraulic Press Manufacturing Co has appointed **J W Palmer** (left) general manager of its Cast-Master operation at Bedford, Ohio. He is succeeded as sales manager there by **R D Critzer** who was formerly associated with Onsrud Machine Works, Chicago

Pratt & Whitney Co, West Hartford, Conn, has elected **Daniel C McCarthy** executive vice president. He joined the company in April 1960 as administrative vice president

For the new needs of the new age

GORTON "Trace-Master" Mastermil Hydraulic Tracer

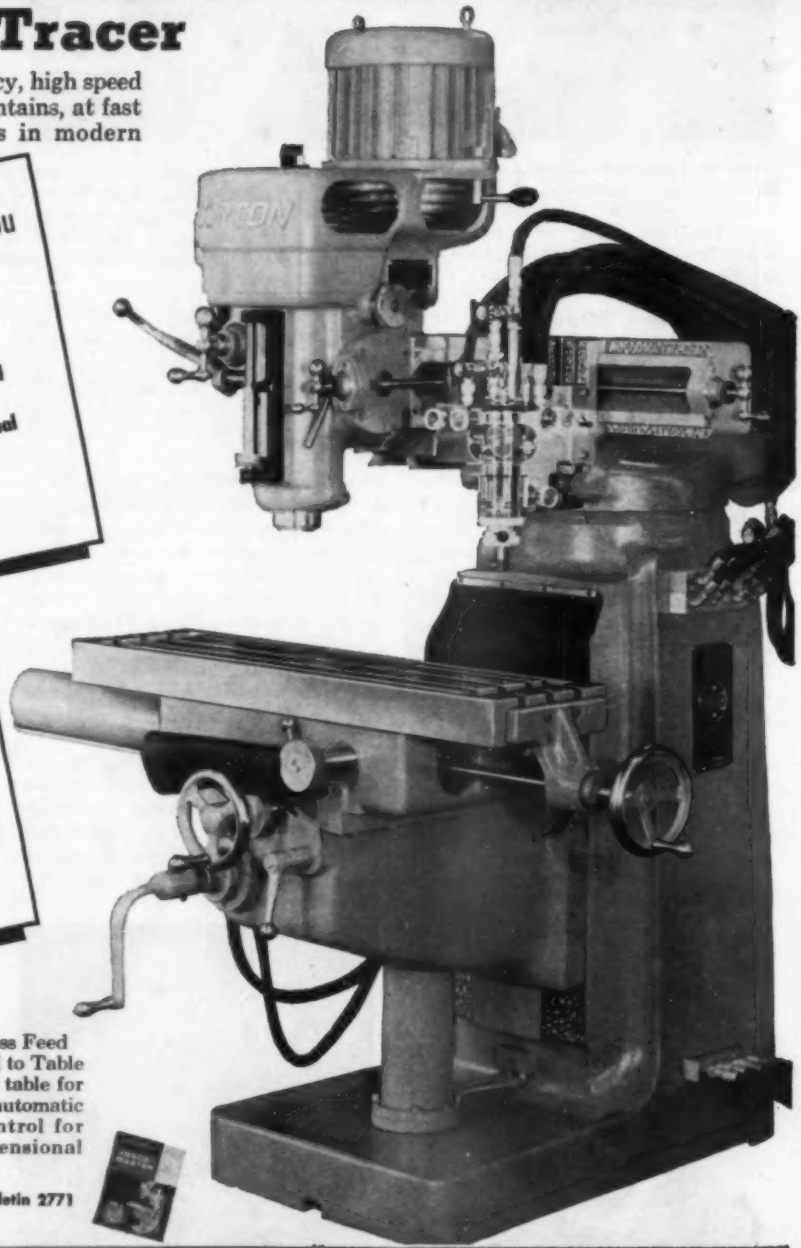
Specially built for high accuracy, high speed profiling and duplicating. Maintains, at fast feeds, the closest tolerances in modern hydraulic tracing.

Nowhere Else will you find this versatility

1. Production profiling
2. Scanning
3. Duplicating . . . die and mold work
4. Milling . . . conventional and climb
5. Boring

Nowhere Else will you find this combination

1. TWO H.P. spindle motor
2. Finest Milling Head in its class
3. 80 to 5,600 RPM spindle speeds
4. Rigidity . . . (2,800 lbs net weight)
5. Extra long saddle



Models Available: (1) 360° Hydraulic Cross Feed to Ram and Longitudinal Hydraulic Feed to Table (2) 3D Hydraulic Feed to knee, ram and table for 3-dimensional work. Also available with automatic Auto-Trace, electro-hydraulic tracer control for either 2-dimensional profiling or 3-dimensional scanning.

Write for Bulletin 2771

GORTON

SINCE 1893

GEORGE GORTON MACHINE CO.

1502 RACINE STREET RACINE, WISCONSIN

Milling, Die Sinking, Profiling and Engraving Machines with Manual Hydraulic, Electro-Hydraulic or Numerical Guidance Systems. Special Machines and Automated Transfer or Indexing Machines. Cutting Tools and accessories . . . Defense and special products.

Die Casting Alloy Claimed Breakthrough

ZAMAC-7, a new zinc die casting alloy, is claimed to give the biggest breakthrough in the field of zinc die casting in 30 years. Using a base of "the purest zinc ever applied commercially" and the maximum practical reduction in magnesium content, plus a slight addition of nickel, the alloy is expected to revolutionize zinc die casting. The alloy has the same mechanical characteristics as ZAMAC-3 and -5.

In addition to giving faster production rates and fewer rejects, the alloy is said to make possible the casting of larger, more complex castings with thinner wall sections. Die design is less critical, and therefore a manufacturer can get into full production faster.

Because ZAMAC-7 has a lower casting temperautre, it will lengthen die life, necessitate less die maintenance, and cause less fouling of dies. In addition, the smoother surface finish claimed for the alloy should reduce pre-plating costs.

The cost of this new alloy, according to company, is "slightly higher."

Company will furnish technical information and information as to how to secure or make the aloy.

The New Jersey Zinc Co, 160 Front St, New York 38, NY

MORE DATA? Circle 92, inside back cover

Brazing Alloy Replaces Silver

For most metals, this nickel-silver brazing alloy rod can be used in place of silver solders with resultant higher strength when more heat is permissible. The working temperature of the alloy is 1700 F. It produces a corrosion resistant weld deposit with a Brinell Hardness of 160 to 170, a shear strength of 150,000 psi, tensile strength of 80,000 psi.

American Brazing Alloys Corp, Pelham, NY

MORE DATA? Circle 93, inside back cover

Iron Alloy for Bearing Retainers Offers Advantages Over Bronze

Rollube, an alloyed iron material, is said to have a number of advantages over conventional bronze usually used for roller bearing retainers. It is now being used as the standard retainer material for many of the company's thrust and radial bearings.

Principal advantages claimed for Rollube retainers over Bronze are:

- It will operate at temperatures up to 800 F.
- It has a coefficient of expansion very close to that of steel.
- It will operate very satisfactorily under conditions of boundary lubrication.
- Permanent expansion or growth at elevated temperatures is much lower than with bronze.

Rollube also is lighter than bronze, and has a yield strength about 1½ times that of bronze.

Rollway Bearing Co, Inc, 541 Seymour St, Syracuse 4, NY

MORE DATA? Circle 94, inside back cover

Latrobe Bearing Steels Give Improvement Over Stainless

A new family of bearing steels, all modifications of standard 440 C stainless, are said to have improved hot hardness properties and better resistance to wear, corrosion, and oxidation than their parent.

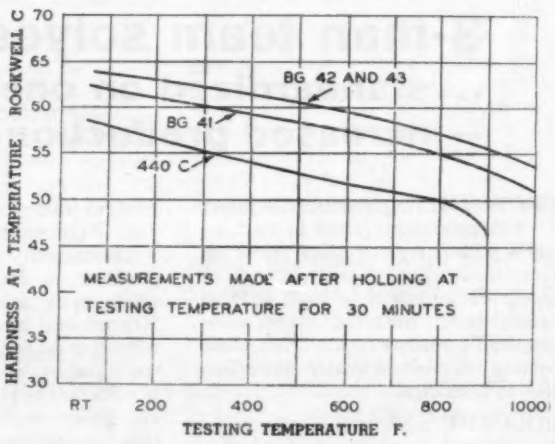
First member of the famliy, Lesco BG 41, is already used in high temperature bearings and structural components in jets and missiles. It is basically a replacement of 2% chromium in the 440 C with 4% molybdenum. The other members of the family, Lesco BG 42 and BG 43, consist of 1% and 2% vanadium, with corresponding higher carbon content than the BG 41.

After heat treatment, these alloys will develop a final heat treated hardness of Rh 62-64 C. An oil quench, cold treating at 100 F, and double tempering at 950 to 100 F is used.

Additionally, an intermediate low temperature temper in the 300 to 400 F range may be used between the oil quench and the cold treatment to minimize the danger of thermal cracking.

The additional volume of vanadum carbide constituent in the BG 42 and 43 alloys gives improved wear resistance; in fact, these alloys could easily be considered stainless high speed steels.

Resistance to temper or hot hardness characteristics of these alloys is shown in the diagram reproduced at the right.



BG 41 is currently produced by air-melting and by the vacuum consumable electrode process. BG 42 and 43 are now air-melted, but the company plans vacuum melting also. Comparison of analyses shows:

	C	Si	Mn	Cr	Mo	V
440 C	1.05	.30	.50	16.50	.50	..
BG 41	1.05	.30	.50	14.50	4.00	.12
BG 42	1.15	.30	.50	14.50	4.00	1.00
BG 43	1.20	.30	.50	14.50	4.00	2.00

Latrobe Steel Co, Latrobe, Pa

MORE DATA? Circle 95, inside back cover

Shop Superintendent—Kennametal Carbide Engineer—Machine Operator

3-man team solves operating problem
...standardized on one insert for all tools —increased production—reduced downtime

PROBLEM: Original carbide insert (not Kennametal), used in machining a wide range of alloy steels on Gray double-cut planer, had complicated shape; could be used only in special head; different inserts were required for other heads. Thin cross section resulted in costly downtime due to breakage.

SOLUTION: Simplified change in tool geometry, recommended by 3-man team, permitted use of Standard Kennametal* carbide insert.

RESULT: Required only one type of Kennametal insert for all tools. Reduced downtime through increased thickness of insert. Provided easier indexing and greater depth of cut. Insert cost for new setup is 60% less than previous insert cost.

That's the kind of product and service that you can get through your Kennametal carbide engineer.

Thoroughly trained in carbide products, he devotes his time exclusively to the sale and application of Kennametal hard carbides . . . and is well qualified to provide on-the-spot analysis and recommendations. If your job requires unusual or special design, engineering and application service, your Kennametal man will make our headquarters engineering and manufacturing facilities available.

Depth of on-the-job experience —plus the continuing development of a variety of tungsten, titanium, and tantalum carbide grades—has lead to the use of Kennametal compositions in practically every industry. And our product development group, by working in close cooperation with customer personnel, keeps coming up with new tooling and carbide grades to meet the ever-changing needs for machining new and difficult alloys and for machining at higher speeds and closer tolerances.

Helping you get the best tool on the job—whether a standard or a special —is the Number 1 assignment of your Kennametal Carbide Engineer. Why not let him help you plan a Top Tooling program aimed at greater profit on every job. Just call him or write KENNAMETAL INC., Latrobe, Pa.

*Trademark 33589

INDUSTRY AND KENNAMETAL ...Partners in Progress

SPS Claims Highly Improved Copper Semiconductor Bases

By using two new-to-the-job alloys and a new production technique, SPS has come up with a family of copper semiconductor mounting bases which double as both electrically conducting mount and heat sink for transistors, rectifiers, and other semiconductors.

Bases made of oxygen-free copper and a zirconium-copper alloy are now machinable because hardening, inherent in the new cold forming process, permits the normally hard-to-machine materials to be satisfactorily machined. In addition, this production method gives much closer dimensional control than the traditional machining of the second-best material, tellurium copper, which could be readily machined.

The new oxygen-free, cold forged copper bases provide as much as 10% more electrical and thermal conductivity than the tellurium copper.

Use of the other copper alloy—a zirconium copper containing 0.15% zirconium—produces a high-strength series of bases which retain high strengths even after exposure to temperatures of 1000 F at which materials generally in use are annealed. This is important, since brazing and welding are presently the favored methods for final assembly of bases and mating caps.

The company currently is producing threaded and non-threaded bases of both new materials in the most widely used 7/16 and 11/16-in. sizes. But it has also made parts ranging in size from miniatures to 1¼ inches across the flats. Even larger sizes should be equally feasible.

Standard Pressed Steel Co, Jenkintown, Pa

MORE DATA? Circle 96, inside back cover

Chromate Conversion Coating Allows Single Dip Operation

Chem-Rite C-55, an inexpensive single dip chromate conversion coating process for cadmium, is said to enhance the brightness of the cadmium deposit and produce a clear chromate surface. In addition, it is extremely easy to operate. No subsequent leaching is necessary, as with some other cadmium bright-dip treatments.

The chief use for the compound is as protective coating for hardware and other cadmium plated products that require long shelf life without discoloration and loss of brightness.

Although the Chem-Rite C-55 can be used with any bright cadmium process, it is said to be especially effective when used in conjunction with the new H-VW-M bright cadmium, Cadalume L.

Hanson-Van Winkle-Munning Co, Church St, Matawan, NJ

MORE DATA? Circle 97, inside back cover

1800 C Brazing Compound Joins Refractory Metals

Molybdenum brazing material, developed in connection with Air Force work on an ion-propulsion engine, joins porous refractory metals such as tungsten, molybdenum, and tantalum. Operating temperature for the brazed joint may be as high as 1800 C.

The brazing alloy features low vapor pressure, low rate of diffusion, and cesium compatibility. Possible applications are high-temperature joints in refractory materials, thermionic converters, and electronic components.

Electro - Optical Systems, Inc, Pasadena, Calif

MORE DATA? Circle 98, inside back cover

Improved Process Developed For Coating Aluminum and Steel

Zelite process for applying protective and decorative finish (in clear or in a variety of colors) to aluminum and steel strip is said to provide many improvements in metal preparation, base conversions, and in the finish itself. After processing, the painted or coated metal is clean and oil-free and will not stain, smudge, or contaminate other elements or assemblies.

The coat assures a permanent protection and reportedly will not craze, crack, or discolor. It resists abrasion, corrosion, and salt or acid, and will not mar when the metal is later stamped, formed, or drawn.

Zegers Inc, 8090 S Chicago Ave, Chicago 17, Ill

MORE DATA? Circle 99, inside back cover

Saturated Asbestos-Glass Paper Comes as Rolls, Sheets or Tape

Style No. 7075 asphalt saturated base paper is said to combine unusual strength with fine texture. It is available in roll, sheet, or tape form up to 40-in. wide.

The combination of glass cloth and a long-fibered asbestos paper comes in 0.008, 0.010, 0.015, and 0.020-in. gages. Weight of the paper is 22 lb per 100 sq yd in the 0.008 gage.

The base paper is a composition of 35% asbestos and 65% glass fibers. Tensile strength, lengthwise, is 50 lb an in.; average tear strength is 90 gm in machine direction, 350 gm in cross-machine direction, in the 0.010-in. gage.

Because of the ability of the paper to receive saturants, the addition of selected resins or treating compound can give unique properties to the end product.

Asbestos Textile Div, Raybestos-Manhattan, Inc, Manheim, Pa

MORE DATA? Circle 100, inside back cover

Teflon Comes in Sphere Shapes For Ball Bearings, Other Uses

Teflon spheres, made completely of the virgin resin produced by DuPont, are available for use as ball bearings as well as detents, spacers, and pivots in conventional and miniaturized mechanical and electromechanical systems. The balls, with diameter and sphericity tolerances maintained within 0.001 in., come in all sizes between ¼ and 4 in.

Because the balls are made from a special high-density TFE resin stock by a special processing technique, they can withstand unusually high compressive forces without permanent distortion or failure. Their operating range is from cryogenic temperatures to above 500 F; coefficient of friction, against steel, is 0.04.

Tri-Point Plastics, Inc, 175 I U Willets Rd, Albertson, LI, NY

MORE DATA? Circle 101, inside back cover

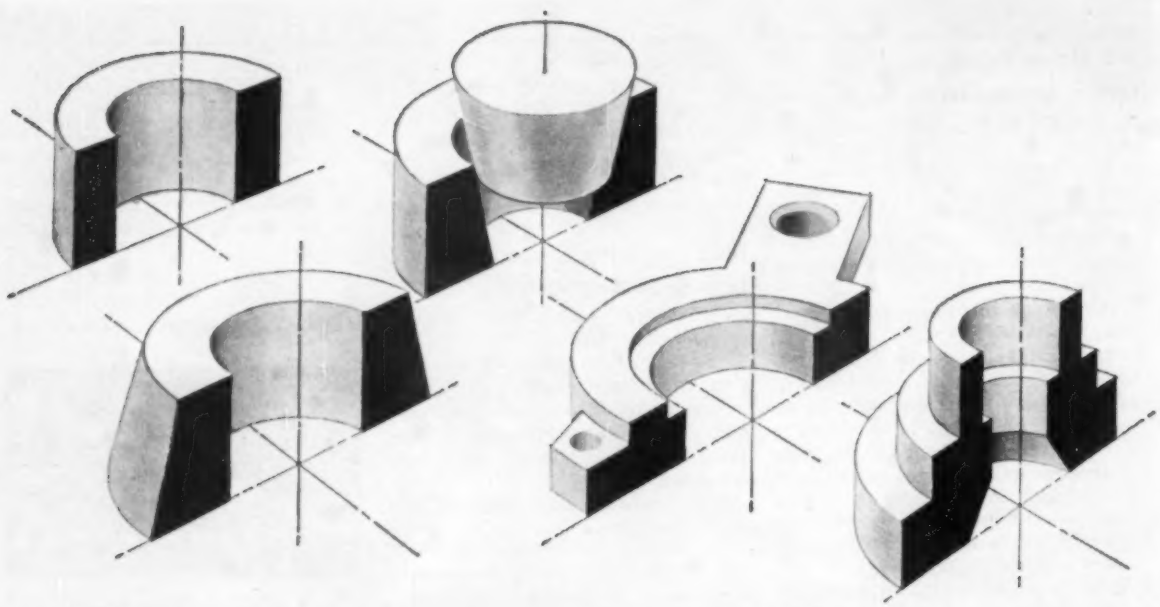
Alcoa Now Offers Coiled Rivet Stock in Wider Range of Sizes

Coiled rivet rod—used to produce bolts and other cold-headed products, in addition to rivets—is now available in diameters up to one inch. It was previously offered in diameters up to 0.615 in.

The large-diameter rivet stock is supplied in all suitable cold-heading alloys in annealed and strain-hardened tempers, in 120-lb coils, measuring about 36 in. inside diameter. Larger, 240-lb coils, are available for quantity orders, subject to special inquiry.

Aluminum Co of America, 762 Aloca Bldg, Pittsburgh 19, Pa •

MORE DATA? Circle 102, inside back cover



when to consider Vertical Grinding

A simple test you can try for yourself quickly determines whether you should consider the Springfield principle of *vertical* grinding. Try it!

CHECK YOUR ANSWERS TO THIS QUIZ	YES	NO
1. Do you grind holes 4" in diameter and larger?	☐	☐
2. Do you grind taper holes or mating parts?	☐	☐
3. Do you grind on irregular shaped work?	☐	☐
4. Do you grind O.D. or I.D. shoulders, offsets, undercuts?	☐	☐
5. Do you grind pieces requiring extreme concentricity?	☐	☐
6. Do you require a 5 micro-inch or better finish?	☐	☐
7. Do some of your grinding jobs require many setups?	☐	☐

If you answer yes to three or more questions, a Springfield vertical universal grinder probably can save real time and money in your plant. Mail the coupon today for your free and informative copy of "Vertical Universal Grinders"; Bulletin 197-F.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

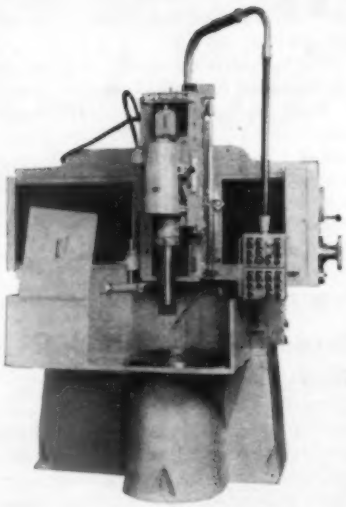
SPRINGFIELD

*name & title*_____

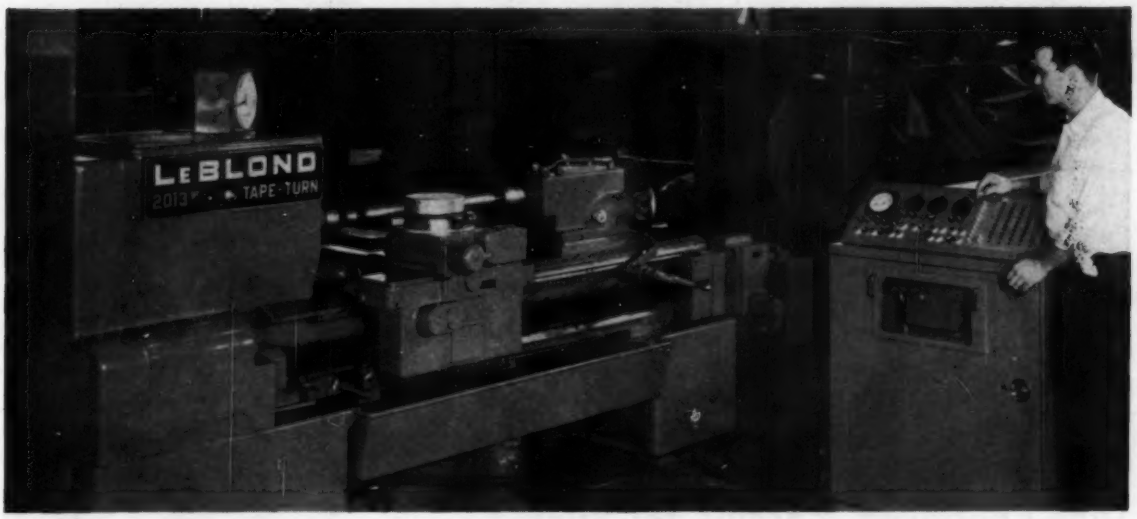
*company*_____

*address*_____

*city, zone, state*_____



Above is a standard Springfield 2A-TR vertical universal grinder. It swings 25"; the grinding head has a 21" stroke and it grinds holes to a nominal depth of 18". The head can be tilted 45° in either direction. Electro-hydraulic control is standard with pendant pushbuttons. The Model 2A-TR costs less than most horizontal chucking grinders of comparable size; it can do the same work plus a wide variety of jobs that just can't be done on a horizontal. Gravity works for you in vertical grinding.



LeBlond Tape-Turn Lathe Contours Without Computer

The first lathe to be teamed with GE's Mark Century solid-state control system, this 2013 Tape-Turn gives full numerical contouring control without a computer. Even tool selection is automatic. Therefore, many contoured parts can be cut with cost savings of up to 75% over tracer turning.

Headstock and carriage on the 2013, which is basically a heavy-duty lathe with 20-in. swing over the bed and 30 in. between centers, have been engineered for complete tape control. Seven gears on three shafts, interlocked by magnetic clutches to give 30 spindle speeds from 22 to 1000 rpm, make up the power train. Drive is a 20 hp motor.

Six standard tools, pre-set in turret, are automatically stationed at one of nine positions from commands "written" on tape. Lathe cuts slopes, curves, angles, radii, tapers, without computer

Control system

The control commands three modes of operation:

- Straight lines, parallel to X or Y axes, or on any slope;
- Clockwise or counterclockwise circular arcs up to 10-in. radius, including compound curves blended of many arcs of different radii;
- Dwells (time delays) for speed changing, turret indexing, etc.

Standard 8-channel paper tape directs tool movement toward headstock or tailstock and in and out; slope functions which determine the degree of angular movement; feeds, speeds, tool turret positions; and miscellaneous functions such as planned stops for checking, coolant on-off, and feed gear range.

Control system has a positioning accuracy at the tool point well within ± 0.001 in. on straight cuts, including slopes, and ± 0.003 in. on a 10-in. radius.

Programming

Although tape control puts the command of turning at the management level—and therefore insures application of engineered data to the cutting edge—the lathe operator is not forgotten. All the control functions can be duplicated by pushbuttons and dials on the console, allowing over-ride of tape if advisable.

Programming is simple. In addition to a knowledge of proper cutting feeds and speeds, all the programmer needs is a part print, a sine-cosine table, and a pencil. He can learn the sequence in half a day.

Because the tool path programmed is that of the center of rotation of the tool nose radius, the turret, which holds six 1 x 1¼-in. forged tools, does not require button-nose tools; in fact, tools with a sharp nose radius are preferable. Compensation for the difference between center of rotation and the acutal tool point is simple, and need be made only in finishing.

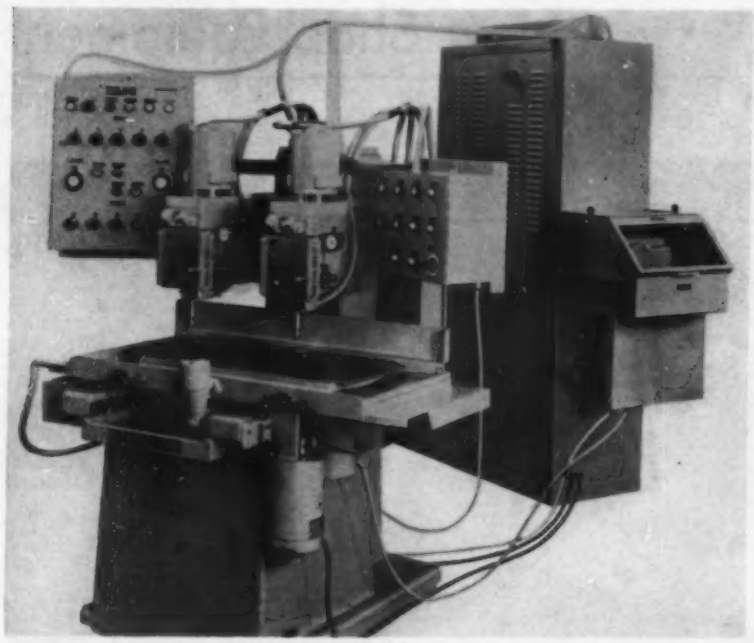
Optional extras

The model shown is not fitted for screw cutting; this refinement can be provided at extra cost. In addition, also at extra cost, provision can be made for turning arcs shallower than those of a 10-in. circle.

Several other heavy-duty Tape-Turn lathes—models 2516, 3220, 4025, and 5032—are also available, and data will be furnished upon request.

The R K LeBlond Machine Tool Co, Madison at Edwards Rds, Cincinnati 8, Ohio

MORE DATA? Circle 51, inside back cover



Tape-Controlled Machine for Printed Circuit Boards Has up to 4 Drill Units

This machine for drilling printed circuit boards can use up to four self-contained hydraulic feed drilling units, adjustably mounted on the cross rail, to drill at speeds in the range of 50 hits per minute per spindle, depending on the hole spacing. It has a modified GE Mark II numerical positioning control which can be programmed by Flexowriter or directly from the machine using art work or a sample board. For the latter purpose, the compound motion table is equipped with a 15X magnification viewer to assure accurate hole location.

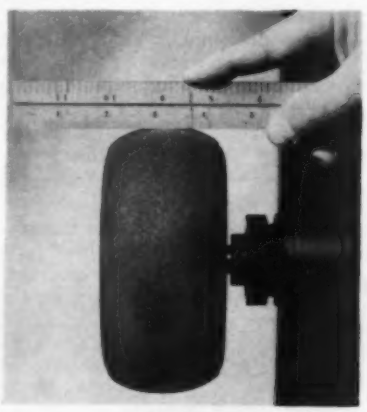
The compound motion table is traversed hydraulically on ball-bearing mounted and guides round ways by self-contained, closed loop, hydraulic circuits and reversible GE Thy-No-Trol controlled motor driven pumps. Positioning accuracy is ± 0.001 in., non-accumulative, with repeatability of ± 0.0005 in.

The self-contained, fully hydraulic feed drilling units are adjustably mounted on a cross rail which has provision for vertical adjustment. Each unit has an automatic cycle of rapid approach, drilling feed, and rapid return with 4¾-in. available spindle traverse and 400 lb max drill thrust pressure. Feed rate is infinitely adjustable.

Standard table motion is 15 in. side to side and 11 in. front to back. F to B motion of 19 in. can be provided if needed. Electrical feedback units for both motions give continuous indication of table position.

Leland-Gifford Co, Worcester 1, Mass

MORE DATA? Circle 52, inside back cover



Crowned Abrasive Bands Grind Contours Without Edge Cutting

Coated abrasive bands and belts, suited for both stock removal and polishing, assume any desired degree of crown when run on inflatable rubber drums. They are recommended for offhand work in combined areas, and particularly on concave or other contoured surfaces. Their crowned shape eliminates the edge cutting that occurs when a flat band is inadvertently tilted, permits accurate grinding on extremely narrow areas, and diminishes chattering when operated at low pressures.

The belts are made of aluminum oxide abrasive in grits 40 through 180 on X-weight cloth, bonded with all-resin adhesives; they are designed for use on smooth-faced or serrated "Valcore" drums made by Nu-Matic Grinders, Inc, of Cleveland.

Bias-cut but not molded, the new bands assume a crowned shape when the pneumatic wheel or drum is inflated. (Degree of crown which can be developed is shown in cut.) Bands are available in three sizes—2 x 9⅝, 2½ x 15½, and 2 x 19-in.—for different speeds.

Behr-Manning Co, Troy, NY

MORE DATA? Circle 53, inside back cover

Motorized Gear Checker Signals Spur and Helical Gear Defects

Red Wing Model GRH inspects center distance of spur and helical gears, and indicates condition of working gear by flash of colored lights. Red flash indicates that work gear is above specified center distance; amber, below. A green light means gear is within inspection limits. Center distance capacity is from 1-⅞ to 12-5/16 in. As an optional feature, red and amber lights may be set to glow for a pre-set time

National Broach and Machine Co, 5600 St Jean, Detroit 13, Mich

MORE DATA? Circle 54, inside back cover

Investment Casting Process Reduces Break-Out Time 50%

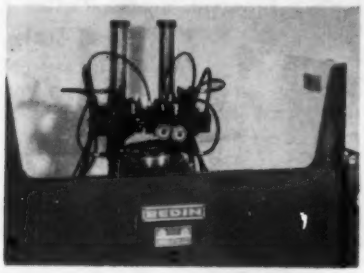
The Planer system for non-ferrous investment casting is said to reduce piece cost by as much as 50%. With this process, only the disposable pattern is burned out, while the entire system of runners is cast in a single plane by a high production cope and drag technique.

The mold is a special low-cost material that allows burn-out in a quarter of the usual time required, and makes a conventional flask unnecessary. This is said to reduce break-out time 50% and eliminate flask replacement and repairs. Surface finishes and tolerances produced with the process are comparable to those of conventional investment castings.

Patents have been applied for on the basic discoveries.

Atlantic Casting & Engrg Corp, Clifton, NJ

MORE DATA? Circle 55, inside back cover



Redin Universal Gear Deburrer Adapts to Spiral Bevel Gears

Model 24 universal gear deburring machine provides angular adjustment to work and wheel spindles which makes it adaptable for spiral bevel gears as well as spur, helical, straight bevel, and worm gears. Maximum swing is 24 in.

Work spindle has a 6-in. hole to accommodate gears and pinions with integral shafts.

Redin Production Machine Co, 2433 20th St, Rockford, Ill

MORE DATA? Circle 56, inside back cover

Analog-to-Digital Converter Said to Have High Reliability

Beacuse this analog-to-digital converter has magnetic circuits for digital switching rather than contacts or light-path arrangements, it is said to have a high degree of reliability. The converter expresses angular shaft position in the form of electrical outputs which can energize a remote digital type indicator. The output circuit, with four decades of 10 circuits each, gives representation of any number from 0 to 9999.

Depending on how a shaft is coupled to the converter, a full range of outputs can be produced with either 100 or 1000 revolutions. In addition, ambiguity of output representation is said to be impossible because only one output per decade is possible at any time.

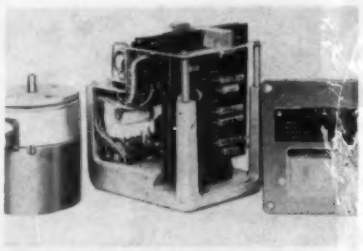
The converter, which is provided with a separate power supply unit, comes for use with 115 or 240 v ±10%, 50 to 400 cycles.

George Kelk Lts, 5 Lesmill Rd, Don Mills, Ontario

MORE DATA? Circle 57, inside back cover

THER-MONIC RADAR-OVEN, which is 25-in. square by 51 in. high, microwave-heats industrial products like plastics, resins and varnishes, photographic films and papers. Power input is 4.4 kw, 3-phase, 220 v, 60 cycle ac, output frequency is 2450 megacycles, yet cooling water requirements are only 1/3 gpm — *Induction Heating Corp, Brooklyn, NY*

MORE DATA, Circle 58, inside back cover



3-Part Jordan Control System Gives Resolution of 1 in 30,000

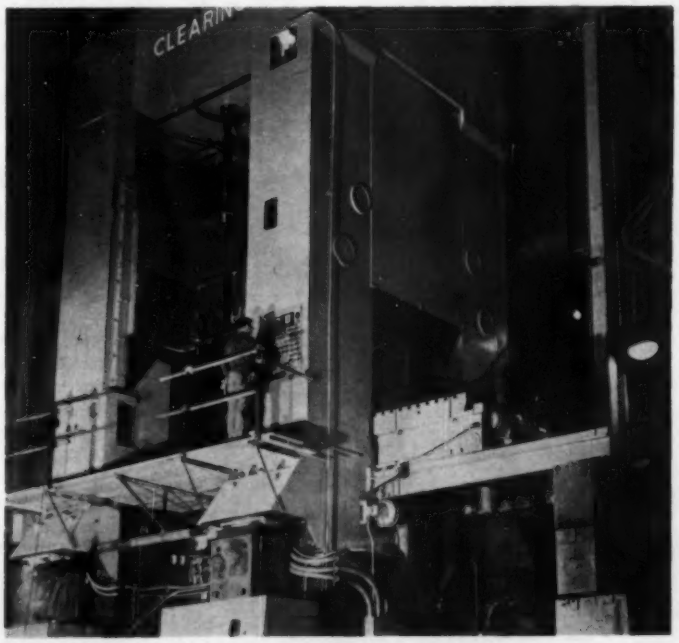
The HA-50 control system, which is said to give resolutions of one part in 30,000 or better, includes a positon sensor (left), a solid state printed circuit amplifier, and a digital readout position setter (right).

The amplifier may drive a standard Shaftrol rotary actuator or Lineatrol linear actuator; or, it can provide control for other electric or hydraulic drives. Amplifier output can be solid state or from relays.

In a typical machine tool application, setting to 0.001 in. is provided over a 30-in. travel.

Jordan Controls, Inc, 3235 W Hampton Ave, Milwaukee 9, Wis

MORE DATA? Circle 59, inside back cover



SINGLE-ACTION ENCLOSED DESIGN PRESS, which weighs about 650,000 lb, is being sent to Isuzu Motor Co, Ltd, Yokohama, Japan. It features two-speed clutch, moving bolsters for quick die changes, cushions with hold-down devices, hydraulic locking devices, overloads, die space lighting, and an automation switch. Isuzu specializes in production of diesel trucks and buses ranging from 2 to 6 tons—*Clearing, Div of US Industries, Chicago, Ill*

MORE DATA? Circle 60, inside back cover

Arc-Plasma Spray Gun Said To Be Smallest Ever Made Commercially

The 25 kw arc-plasma spray gun (right) is less than 2 in. long and 1½ in. in diameter. The plasma tool, which weighs less than 1 lb, is said to be the smallest ever commercially produced. (Above, it is compared to a 40 kw model.)

The gun has successfully been used in spraying corrosion resistant and high temperature coatings on interior walls of small rocket nozzles, cylinders, and chambers. Its efficiency factor for changing electrical energy to heat is said to be more than 60%.

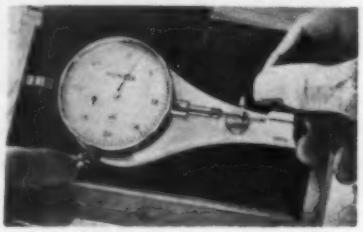
Also recently introduced is the 80 kw arc-plasma spray gun (slightly larger than the models shown) which is said to deposit coating material over three times faster than any other portable plasma spraying device. Zirconia, for example, is deposited at a rate of 10 lb an hr. Corresponding rates for alumina and tungsten are 12 and 20 lb an hr, respectively.

The 80 kw gun weighs 4½ lb, and measures 2¾-in. in diameter by 4 in. long.

The arc-plasma spray coating technique makes possible deposition coatings on nearly all materials at temperatures frequently exceeding 20,000 F without oxidation of either base material or coating.

Plasmadyne Corp, 3839 S Main St,

MORE DATA? Circle 61, inside back cover



Bench Micrometer Measures Parts From 0 to ½ in.

Instrument is designed for checking small subminiature and microminiature parts. Measurements can be read down to ½ thousandths of an inch and estimated down to ¼ thousandths of an inch. Pilot use indicates that as many as 10 or 20 micro parts can be checked in a minute.

R N Hunter Sales Co, 9851 Alburtis Ave, Santa Fe Springs, Calif

MORE DATA? Circle 62, inside back cover

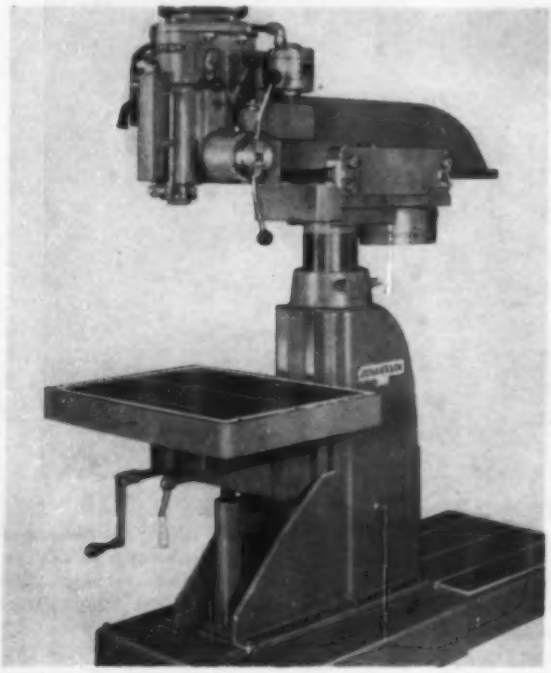
Gerber 30x30-in. 2-Axis Plotter Accurate to 0.05% of Full Scale

Based on a new engineering concept that eliminates servo mechanisms, this 30 x 30-in. X-Y plotter is said to be accurate to 0.05% of full scale and to repeat exactly from any direction. Standard models are available up to 48 x 48-in., and larger models can be developed with the same accuracy.

Input to the plotter can be from IBM cards, punched paper tape, or keyboard. Slewing speed is up to 20 ips. The printing head contains twelve symbols, any of which can be selected at random; other print sectors can also be added to plot digital as well as symbol information.

The Gerber Scientific Instrument Co, Hartford, Conn

MORE DATA? Circle 63, inside back cover



Johansson Precision Radial Drill Said to Fill Gap Between Uprights, Large Radials

This precision radial drilling machine was designed to fill the gap between sensitive upright drills and large radial drills. Unlike conventional radials, where the arm moves up and down, the column on this machine is supported in a housing that provides longer bearing support and inherent added rigdiity.

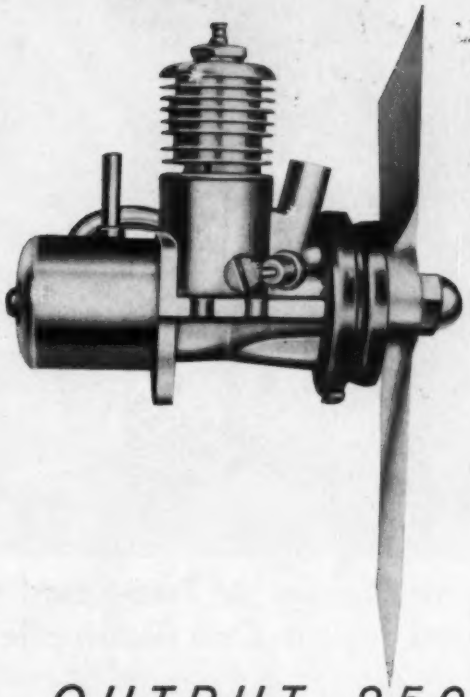
The radial arm, or ram, comes in 3 or 4-ft lengths. It swings through 360° for positioning at any location over the 20 x 40-in. work table at front of machine or the 25 x 42-in. work platform at rear.

Rotation of column and movement of ram are both locked simultaneously and instantly when operator presses a button which actuates an electro-mechanical lock. When the column is locked from rotating, it can be moved up or down 12 in. in column housing, giving 54 in. max and 6 in. min from spindle to work surface, without losing drill location. Because of a column power elevation mechanism, deep hole drilling of up to 22 in. can be done without any makeshift method.

A direct gear drive provides 16 spindle speeds in four optional ranges from 34 to 1640 rpm. Optional equipment includes tool ejector and automatic tapping mechanism.

I O Johansson Co, Skokie, Ill

MORE DATA? Circle 64, inside back cover



INCREASES TOOL OUTPUT 2500%

BESLY X-PRESS® TAPS THREAD 101,100 HIGH-COMPRESSION ENGINE HEADS WITHOUT TOOL CHANGE!

Besly X-Press Taps eliminate internal thread cutting . . . speed-form threads quickly and accurately without chips or shavings. Ideal for ductile metals such as copper, brass, aluminum, lead, leaded steel, as well as die castings. Exclusively Besly's and Besly's Licensees', cost-cutting X-Press Taps have already established spectacular records in many mass-production fields. Patent No. Re. 24,572. Other patents pending.

Mass production under strict quality control! . . . 3500 engines daily! That's the output of Wen-Mac Corp. of Los Angeles, a subsidiary of AMF *and* the world's largest manufacturer of quality model aircraft and engines. Here, as in countless other industries, Besly X-Press Taps are reducing the cost of precision.

On two threading operations (.507″ and .590″) on the engine crankcase the X-Press tapped an average of 31,000 parts without tool change. Wen-mac happily reports that Besly X-Press Taps last an average of 31 times longer than the conventional cutting taps formerly used. Tapping their high-compression engine head for a platinum tip glow plug calls for tight fit and freedom from shavings. In this aluminum alloy, X-Press Taps *speed-form* a ¼″ thread in 101,100 volume without a tool change. These internal threads are extra-strong, smoother, and are tapped without chips or burrs. And, X-Press provides more consistent thread gaging, too.

Whatever the tapping requirements, you'll find the right answers at Besly. Phone or write for the complete Besly Tap catalog.

BESLY-WELLES CORPORATION

120 Dearborn Avenue, South Beloit, Illinois

Grinders and Abrasives • Taps • X-Press Taps® • Drills Reamers • End Mills • Gages • Carbide Tipped Tools, Blanks, Inserts and Holders

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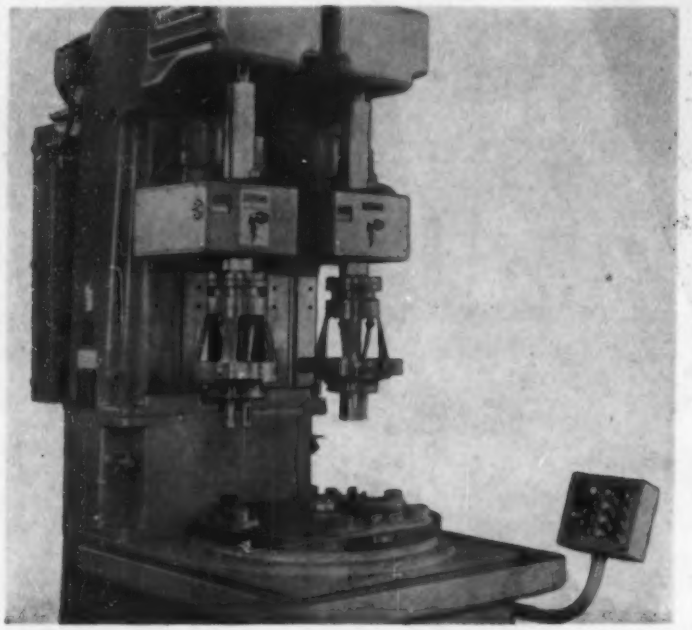


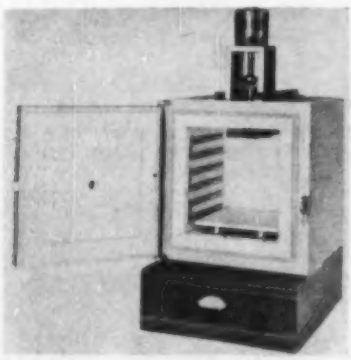
Cleereman Series 'A' Two-Spindle Machine Drills and Taps in One Automatic Cycle

Because two or more columns can be mounted on a special base over a rotary index table, this Series A drilling and tapping machine readily adapts to special applications of precision, high production work. A complete cycle is obtained at all stations simultaneously by merely depressing a push button. And, while the tools are working, the operator removes the finished part and loads another at the loading and unloading station.

According to the manufacturer, the machine features ease of setup, pick-off change gears, broad ranges of speeds, feeds, and tap leads; therefore, it is adaptable for small lot or production runs.

Cleereman Machine Tool Corp, 7350 W Lawrence Ave, Chicago 31.

MORE DATA? Circle 65, inside back cover



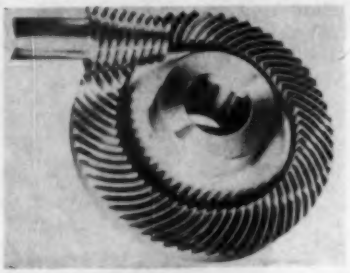
New Dyna-Trol Furnaces Have Compact Base, Convection Fan

Forced convection fan provides an automatic and even gradient in the furnace at any point along the heat curve. Operating temperature is 1875 F with fan; for operation above this point the fan can be easily removed.

A constant level of temperature can be maintained, ranging from 300 to 2300 F by input controllers which can be set from 7 to 100% of input. Zone gradient control operates by multiple circuits with each cricuit having its own input controller. Gradients are indicated by a pyrometer and two thermocouples, located zonewise, and a thermocouple selector switch. Heating elements are rigidly supported by specially designed Dyna-Glow element holders. Excellent heat transfer properties are said to result and a low mass characteristic keeps overshoot and undershoot of the temperature control point to an absolute minimum, especially when using automatic temperature controls.

L & L Mfg Co, 804 Mulberry St, Upland, Chester, Pa

MORE DATA? Circle 66, inside back cover



Precision Spiroid Gears Available From Stock

Produced under special license agreement with Illinois Tool Works, these spiroid gears in ⅛, 3/16, and ¼-in. shaft sizes, offer the designer of small package assemblies added advantages in backlash control, shock strength, noise level, and accuracy in high-ratio, right angle gearing applications. Multi-tooth contact design provides inherent precision control.

Pic Design Corp, 477 Atlantic Ave, East Rockaway, Long Island, NY

MORE DATA? Circle 67, inside back cover

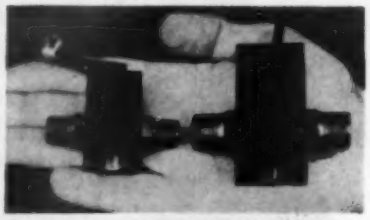
Internal Recessing Tool Said To Solve Most Earlier Problems

Intramatic internal recessing tool, which is said, for the first time, to solve problems found in preivous offset-shaft tools, will perform, automatically, many operations that were heretofore considered impractical. One basic Model JA will work in holes within the range of ½ to 2 in. (with appropriate interchangeable pilots and cutters). A larger model fits holes to 6-in. dia.

The tool will handle wide face or multiple-form grooves, has deep grooving capabilities, and places no limitations on groove position.

Nobur Mfg Co, 6860 Farmdale Ave, North Hollywood, Calif

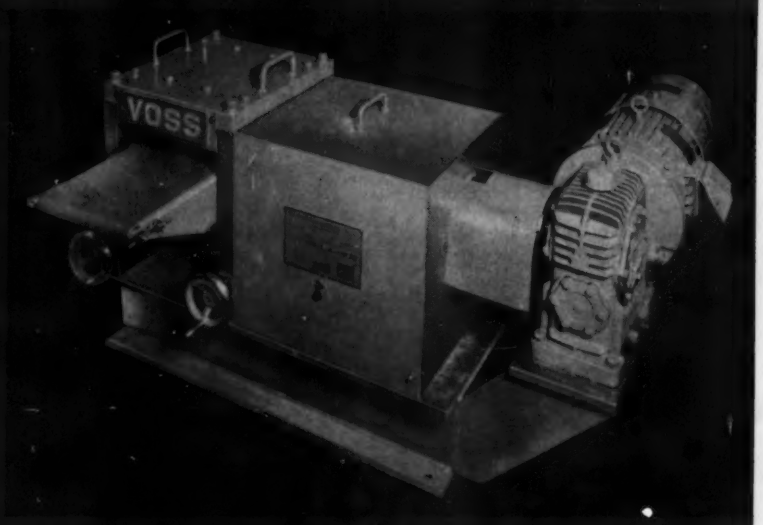
MORE DATA? Circle 68, inside back cover



MALE PIPE CONNECTIONS TURN on these micro-valves; therefore, they can be installed without added expense of unions. Two or more of the valves, which operate at up to 100 psi, may easily be manifolded together for multiple operation—*Instruments Inc, PO Box 556, Tulsa, Okla*

MORE DATA? Circle 69, inside back cover

SPECIAL REPORT



New Parts-Flattener Ups Production Speeds 1,000% Or More . . .

Bold statement? Yes! True? Yes! In some of its present applications, two Voss flatteners and a few operators have replaced hundreds of workers assigned to hand flattening.

Principles of Voss Roller Leveler Applied—An adaptation of the Voss precision Roller Leveler, considered the Cadillac of its class, the flattener operation is based on a series of small diameter work rolls supported by multiple back-up bearings. Parts are worked to relieve stresses, achieving within .005 of dead flatness in one pass.

Reliability Built In—One of the important characteristics of the Voss Roller Leveler is its reliability and minimum downtime. The flattener shares these qualities. Rugged construction of the machine insures a long and productive life.

Hand Feed or Automatic
The flattener is available either way. Most models are compact enough to sit on a desk top. The machine will handle an extremely wide variety of flat stamped parts. It can also be engineered to flatten parts having irregular surfaces.

Let Voss help you to automate your parts-flattening. Call or write today.

We'll be glad to arrange a demonstration with your parts, without obligation.

Voss ENGINEERING CO.

7301 Penn Ave. Pittsburgh 8, Pa. Churchill 2-4422

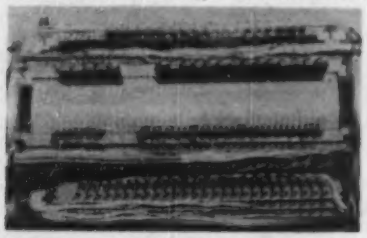
Illuminated Pushbutton Available For 110 to 550-v Applications

Oil-tight device that combines the functions of a pushbutton and an indicating light in a single unit incorporates a color-coded, molded type transformer designed to be immune to voltage surge lamp damage. The unit can operate with multiple contact blocks with any combination of NO or NC contacts.

Additional features include base and one-hole mounting; plastic lenses in red, blue, amber, green, clear, or white; it is furnished for 110, 220, 380, 440, and 550-v applications.

Cutler-Hammer, 205 N 12th St, Milwaukee, Wis

MORE DATA? Circle 70, inside back cover



Memory Presents Information Whether Moving or Stationary

Dynastst, a magnetic memory drum particularly suited to program control of multiple-cutting operations, presents recorded information whether it in motion or is stationary. Thus, it can present cutting coordinates on a step-by-step basis, remaining stationary while the associated machine tool completes a cut.

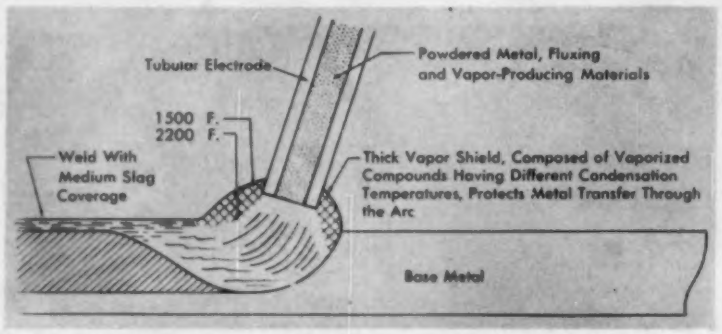
In the stationary condition it continuously presents information for comparison and control. At the end of a cut, the drum steps to its next position, corresponding to the end of the next cut, and signals the new co-ordinates to the machine. This process continues until the machining operation is completed when the drum cycles rapidly back to its starting position.

Output from the drum has sufficient power to eliminate the need for sensitive amplifiers: Output into 1,000 ohms is 1.5 v dc for a "one" reading, less than 30 millivolts for a "zero"; into a cold cathode matrix, drums may have an output of 65 v ac for one, less than 2 v for zero.

Size varies with quantity of information to be recorded. Costs vary in accordance with complexity of application, but, typically, run in the vicinity of $300 per channel.

Consolidated Controls Corp, Bethel, Conn

MORE DATA? Circle 71, inside back cover


Tubular Electrode
Powdered Metal, Fluxing and Vapor-Producing Materials
1500 F.
2200 F.
Weld With Medium Slag Coverage
Thick Vapor Shield, Composed of Vaporized Compounds Having Different Condensation Temperatures, Protects Metal Transfer Through the Arc
Base Metal

Lincoln Develops Innershield Hand Gun

The Innershield arc-welding process, formerly suitable only for specialized, fully automatic applications (*AM*—May 5 '58, p150), can now be put to work on manual jobs with a new hand-held welding gun.

The equipment is said to be compact and simple to operate: The gun itself is little more than a nozzle with an actuating trigger and pistol grip. A wire-feed mechanism feeds the wire and current through a cable to the welding gun.

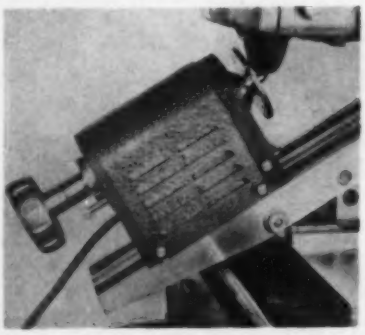
To operate, the welder simply pulls the trigger and moves the gun along the seam to be welded. The power source is a motor generator.

The Innershield process employs a tubular electrode wire that contains all the necessary shielding, deoxidizing, and fluxing agents. The new hand-held gun has the flexibility of manual arc welding plus an unusually high welding speed.

A special feature of the process is vapor shielding. Metallic salts and oxides in the core of the wire vaporize and expand in the heat of the arc. As they reach the isothermal cone that corresponds to their condensing temperature, they recondense, forming a relatively thick vapor shield around the arc and molten metal and preventing contamination by the surrounding atmosphere.

The Lincoln Electric Co, 22801 St Clair Ave, Cleveland 17, Ohio

MORE DATA? Circle 72, inside back cover



Attachment for Surface Grinders Permits Varied Operations

Cylindrical grinding and indexing attachment makes it possible for any surface grinder to grind disc cutters, points on lathe centers, mill saws, flats on a 30° 3-square triangular punch. Straight or tapered jobs can be handled quickly by placing this attachment on a magentic chuck and mounting the work between centers or in spring collets or chucks. For grinding perfect tapers, the attachment has a two-way 5-in. sine bar tilt adjustment.

Use of gage blocks eliminates guess work. Index plates cover a wide range of divisions for grinding parallel flats or angles. Attachment has three spindle speeds, 200, 400, and 700 rpm. Capacity, between centers, is 7½ in. in length and 6½ in. in diameter. Collet capacity is ⅝ in.

Therien Engrg & Machine Co, 4908 N Odell Ave, Chicago, 31, Ill

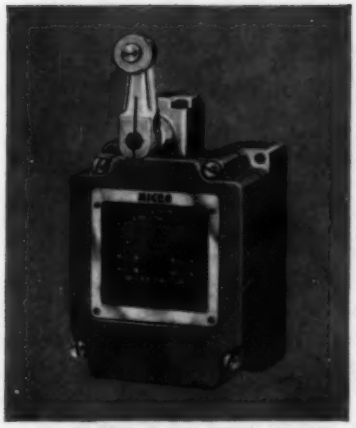
MORE DATA? Circle 73, inside back cover

LABELING TOOL, DeLuxe Dymo-Mite Model M-3, has chrome-plated aluminum body and a built-in corner rounding and hole punch device. It will emboss company's complete line of tapes, both pressure senstive colored plastic and metals. Price is $51.95—*Dymo Corp, 2546 Tenth St, Berkeley 10, Calif*

MORE DATA? Circle 74, inside back cover

MICRO SWITCH Precision Switches

Neon Check Light Signals Operating Position!



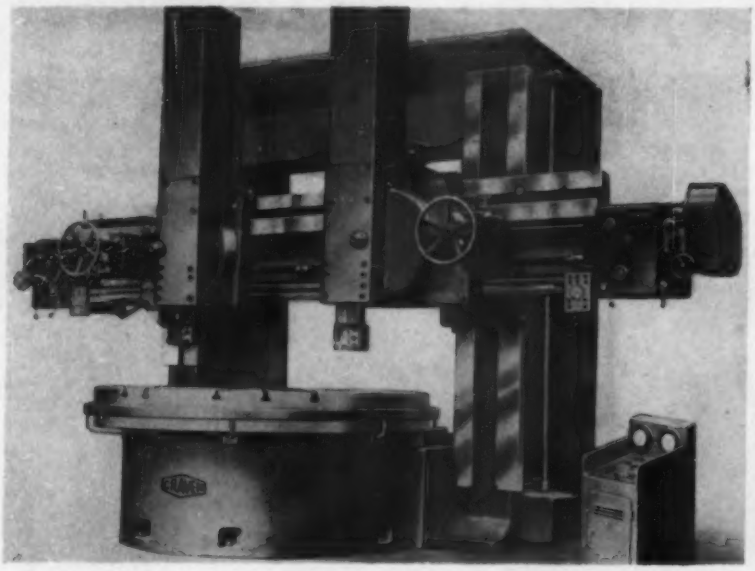
New "301LS" is another in MICRO's line of "Plug-in Limit" Switches. This model contains 2 basic switches, each with a normally open and normally closed circuit.

The new "LS" Limit Switch has a translucent plastic insert and enclosed neon light that tell at a glance whether the switch is functioning. Perfect answer for checking switches that must be located in inaccessible or poorly lighted areas, or where it is important to be able to check a large number of limit switches on a production line in minimum time. The new switch is an addition to MICRO's line of compact, high capacity "LS" limit switches.

New "301LS" has two basic switches which are operated when the actuating lever is moved clockwise or counterclockwise. Internal adjustments are easily made to provide sequence operation of the two enclosed switches. Sequence control is useful on tool slides to 1) switch from rapid traverse to feed rate and then 2) with the second switch, return the tool to the original position. Sequence control is also used as a positive limit stop where machine damage could occur by a fault in the first switching circuit. See the Yellow Pages for your nearby MICRO SWITCH distributor or write for Data Sheet 187.

MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls, Limited, Toronto 17, Ontario

Honeywell
MICRO SWITCH Precision Switches



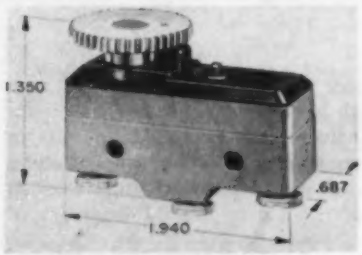
British Vertical Boring Mill Can Have 5 to 42-ft Table, Copying Attachment

This heavy duty vertical boring mill, made in England with 5 to 42-ft-dia tables, comes in production line versions with electronic copying equipment. A large selection of specialty tools can be supplied.

Tables are supported on one or more (depending on size) annular V-sections. Main drive to table can either be a constant AC motor and 12 speed gear box, or a variable speed DC motor with gear changes electro-hydraulically controlled by pushbuttons from a central station. An independent motor operates cross slide.

Craven Machine Tool Sales, Div B Elliott (Canada) Ltd, 333 Main St, Hackensack, NJ

MORE DATA? Circle 75, inside back cover



Basic Switch Incorporates Adjustable Differential Travel

A knurled wheel on top of the switch permits differential travel adjustment from 0.0025 to 0.007 in. Altering the differential travel changes the contact break distance, the pretravel distance, and the operating and differential forces. The operating force varies from 12 to 32 oz and the differential force from 2 to 15 oz. The release force, however, remains at 10 oz regardless of the differential setting.

This switch, designated 10BS210, is reported to be especially suited for controlling such precision devices as pressure controls or blower fans. The adjustment wheel permits extremely sensitive control.

Micro Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill

MORE DATA? Circle 76, inside back cover

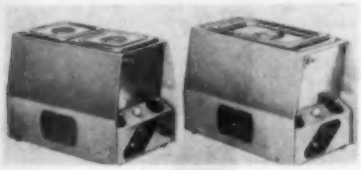
Vibratory Finishing Machine Designed for Laboratory Use

Portable Vibrodyne Model V-013 is particularly adapted for deburring, radii-forming, descaling, cleaning, and polishing of small parts, powder metal gears, steel bushings, aluminum and copper parts for the electronic industry, ceramic eyelets, discs, and wedges.

Unit is 18 in. long, 11 in. wide, 11.5 in. high, and weighs 29 lb. The ⅛-cu-ft (approx 1 gal capacity) tub may be rotated to any angular position for dumping or screening. The companion control is 6 in. wide, 6½ in. deep, 10½ in. high, weighs 8 lb, and is complete with electric timer, pilot light, fuse, and variable transformer. Operation is from 115-v single-phase 60-c power, consuming less than 40 w.

Stevenson Co, Wellsville, Ohio

MORE DATA? Circle 77, inside back cover



Two New Ultrasonic Cleaners Added to Ultra-Cleen 320 Series

The 320D contains twin transducerized tank each with a 1¼-qt capacity; the 320L features a single transducerized tank with a capacity of 3⅜-qt. The Ultra-Clean 320, first of the series, has a 1¼-qt transducerized tank and a 1½-qt rinse tank.

Tank dimensions of the 320D are 5⅜ in. sq by 3 in. deep at the top with a ½-in. taper on each side. Tank dimensions of the 320L are 5⅜ x 9⅜ x 4 in. deep at the top with ½-in. taper on each side.

L & R Mfg Co, 577 Elm St, Kearny, NJ

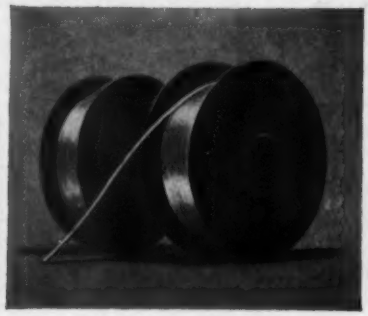
MORE DATA? Circle 78, inside back cover

MICRO-FINISHING BLADES are available for all Wesson cam-pin cutters using ¾-in.-sq throw-away inserts. By replacing just one of the square inserts, surface finishes consistently below 50 microinches, rms, is possible. Blades are stocked in the five most popular Wessonmetal carbide grades —*Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich*

MORE DATA? Circle 79, inside back cover

A simple, effective, low cost rust and corrosion control that . . .

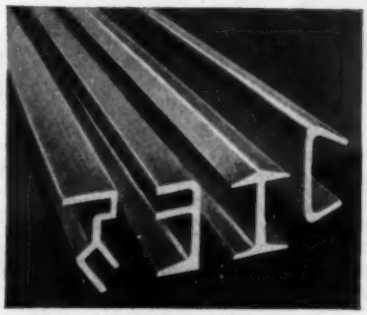
- *is easy to apply*
- *eliminates moisture*
- *prevents corrosion*
- *need not be removed*

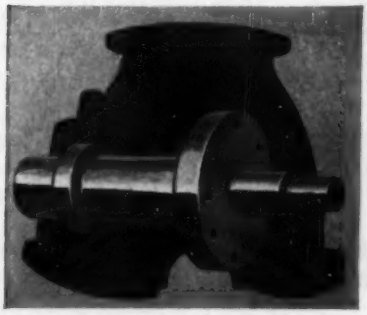


For Manufacturing Processes

The manufacture of welding wire poses a corrosion problem from coolants used to lubricate and cool dies used in the rolling or drawing process. One manufacturer of welding wire tried applying CRC 3-36 before running the stock through the mill and obtained excellent results. Now all stock is coated with CRC 3-36—corrosion is controlled and no stocks are lost due to rust.

CRC 3-36 has a dual action which first removes moisture from the surface, driving it out of grain boundaries, cracks and pores. It then forms a thin molecular film of approximately 2 microns over the surface and seals it against subsequent deposits of moisture and the action of corrosive atmospheres.





For Castings & Large Machined Parts

A steam turbine manufacturer, after exhaustive tests, now uses CRC 3-36 exclusively to protect metallic surfaces of parts and equipment in various stages of manufacture from deterioration due to corrosion. After standardizing on CRC 3-36, the necessity for stocking, coding and handling a wide variety of products was eliminated. In addition, CRC 3-36 does not have to be removed before subsequent processing. Substantial savings are being realized through the use of CRC 3-36.

This manufacturer has also found that CRC 3-36 will protect all metallic surfaces from rust and corrosion during shipment.

For Extruded Aluminum

An aluminum manufacturer received complaints that bright aluminum extrusions arrived at distribution points covered with a dull coating of oxide. Exhaustive tests under actual shipping conditions show that an inexpensive coating of CRC 3-36 eliminated oxidation during shipment and that distributors, in turn, could ship bright and shining extrusions months later to customers with no complaints about oxidation. Furthermore the extrusions were ready-to-use as CRC 3-36 does not have to be removed.

New! CRC Soft-Seal for Severe Conditions

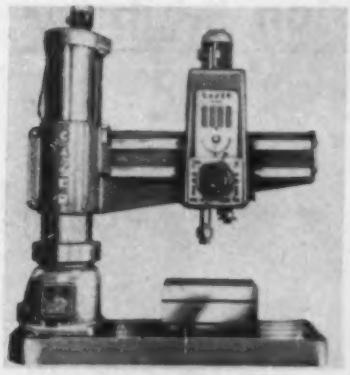
If you are using expensive interior storage space for metal stocks, dies, jigs and fixtures, these may be coated with Soft-Seal and stored outside to release inside space for productive use.

For further information, write to
Corrosion Reaction Consultants,
A SUBSIDIARY OF
THE CHAS. J. WEBB SONS CO., INC.
116-D Chestnut Street, Phila. 6, Pa.,
or telephone WAlnut 5-0200.

CRC FORMULA 3·36 METALS INDUSTRY

Metal Protection for
MANUFACTURING • STORAGE • PACKAGING

Ask your local industrial distributor for a trial supply.



Caser Radial Drills Offered In Three New Models

New models added to the Caser (French) line have a 21, 25, and 29-in. column with 7, 8, and 10-ft arm respectively. Machines feature electro-hydraulically preselected speeds and feeds wtihout necessity for stopping the machine, and 32 speeds from 12 to 1500 rpm.

Additional features: spindle is controlled by a hydraulic multi-disk clutch that needs no adjustment; spindle quill slides in a special chrome-nickel cast iron replaceable sleeve with hardened and ground mirror finish surface; electromagnetic over-load safety device for the feed; pushbutton-controlled up and down movement of the arm combined with automatic locking and unlocking of arm on column; electro-hydraulic pushbutton clamping of column and drilling head.

Dist by Hermes Machine Tool Co, 48-15 Northern Blvd, Long Island City 1, NY

MORE DATA, Circle 80, inside back cover

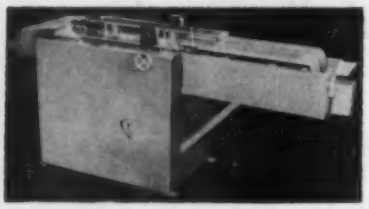
Electric TIG Welder Designed For Range of 13 to 295 amp

Features of the TIG-WELD 295 ac welder include fully rated duty cycles for TIG welding—40% at 200 amp or 30% at 295 amp; electrically controlled gas and water valves; high frequency intensity control; direct or remote operation; post flow control and pilot light.

List price is $450 for the 230-v unit and $465 for the 460-v model.

Emerson Electric Mfg Co, 8100 Florissant Ave, St Louis 36, Mo

MORE DATA? Circle 81, inside back cover



Flange Former Can Fold Up to 3000 Blisters Per Hour

Continuous plastic double flange forming machine, designated Model C, makes 90 or 180° flanges on any thermoplastic 0.005 thick and higher. It folds blisters to take cards from 1¼ in. in width up to a maximum of 14 in. with card thicknesses up to ⅛ of an inch. Folding is done as the plastic moves across a pair of heated die bars. The machine is easily adjusted for variations in flange and foldover requirements.

Design features include variable speed drive; tooling design that allows constant heating of top or bottom edges as they are folded at all points along the forming die bar; dual thermostatic controls that assure precise heat transfer at desired temperature regardless of operating speed. Unit measures 100 x 30 in., is 44 in. high and weighs 750 lb.

Tronomatic Machine Mfg Corp, 25 Bruckner Blvd, New York 54, NY

MORE DATA? Circle 82, inside back cover

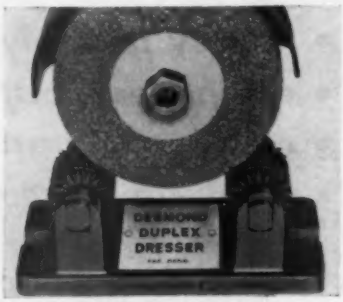
Welding Gun and Torch Have Interchangeable Barrels

New Automanual welding gun (AM-7) for all MIG and carbon dioxide-shielded welding processes, and an automatic torch (A-10) for MIG and TIG welding have interchangeable barrels. The gun is fitted with an adjustable pistol grip and the torch can be mounted singly or in a standard mount holding two torches for parallel or tandem welding.

The units provide complete shielding using 25% less gas than any previous gun or torch, according to manufacturer. The multi-use barrel runs cool even at maximum 600 amp. Hose kinking is minimized because all cable, hose, and wire conduit enter at one location in line with the flow of welding wire. Both units can be used to weld ferrous and nonferrous metals. Consumable electrode length between the current contact and the arc is adjustable by means of a knob at the rear of the gun and the torch.

National Cylinder Gas Div, Chemetron Corp, 840 N Michigan Ave, Chicago 11, Ill

MORE DATA? Circle 83, inside back cover



Grinding Wheel Dresser Has Double Cutter Unit

Desmond Duplex is designed for dressing and truing straight-faced grinding wheels used on flexible shaft and portable grinders. Wheels of from 4 to 8 in. in diameter can be dressed without removing them from their spindle. The revolving grinding wheel is cradled between the cutter units for a few seconds and the face of the wheel is dressed straight.

Unit is 2¾ in. high with a base 7 in. long by 3¼ in. wide; weight is 6 lb. It may be bolted or screwed to a bench or any flat surface.

Desmond-Stephan Mfg Co, Urbana, Ohio

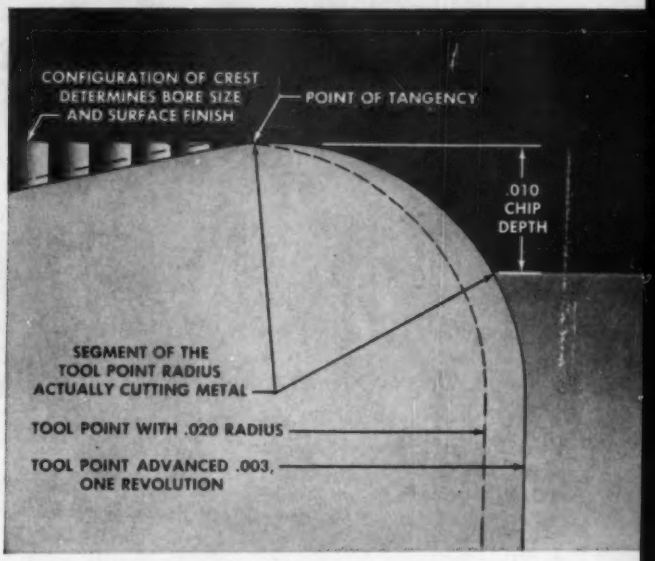
MORE DATA? Circle 84, inside back cover

ADJUSTABLE BACK FACEPLATE upgrades old or new chucks; it permits indicating a chuck within 0.0001. It is available in four standard sizes, 5, 6, 8, and 10 in.—*Wesco Tool Inc, 2820 San Fernando Blvd, Burbank, Calif*

MORE DATA? Circle 85, inside back cover

special report from Fair Street on cutting tool geometry

ONE OF A SERIES


CONFIGURATION OF CREST DETERMINES BORE SIZE AND SURFACE FINISH
POINT OF TANGENCY
.010 CHIP DEPTH
SEGMENT OF THE TOOL POINT RADIUS ACTUALLY CUTTING METAL
TOOL POINT WITH .020 RADIUS
TOOL POINT ADVANCED .003, ONE REVOLUTION

why accurate blend of nose radius to cutting edge angles is all-important

Function of the nose radius in a single point cutting tool is to gradually decrease chip thickness at or near the finishing point of the tool. This controlled decrease in chip thickness greatly reduces pressure and heat generation on the cutting edge of the tool in the area of the finishing point.

As illustrated above right, the finishing point of a single point cutting tool is actually the high point of the nose radius just prior to its blending into the end cutting edge angle. This point is the heart of the machining process. Improper grinding technique will not result in a radius, but produces a form ground with flats or one that does not blend perfectly to the cutting edge angles. In either case the tool cannot perform its proper function. Hence, the thousands of dollars in engineering, tooling and machines are not being used most effectively.

As all-important as the nose radius blend is, it is virtually impossible to control this nose radius by conventional grinding practices. Using a regular offhand grinder, the operator is forced to dub in a free hand radius after carefully generating end cutting and side cutting edges. He has no other choice.

NEW MICROPOINT TOOL GRINDER SOLVES THE PROBLEM

The problem of accurate blend of nose radius to cutting edge angles for maximum efficiency has been completely solved by the DeVlieg MICROPOINT Tool Grinder, a new type of single point tool grinder developed by the DeVlieg Machine Company.

This new machine, the first grinder in its field able to grind tool profiles geometrically correct to gauge room accuracy, generates the side cutting edge and end cutting edge exactly tangent to a geometrically perfect nose radius. This accuracy is an automatic function of the machine and is in no way dependent upon the human element of the machine operator.

ABSOLUTE CONTROL OF TOOL GEOMETRY

Not just another grinder, MICROPOINT is a precision machine that makes possible a new technique of single point tool grinding. Advantages of this new technique include greater cutting tool life, increased accuracy in output of machine tools and greatly improved uniformity and finish of the end product.

Direct dial settings provide a method of fast, simple, accurate adjustment for radius, cutting edge angles, tool point offset and relief in exact accordance with the geometric requirements of the tool in a full range of sizes and shapes.

For further information about the DeVlieg MICROPOINT Tool Grinder, please write or visit DeVlieg Machine Company, Fair Street, Royal Oak, Michigan.

DeVlieg

MICROPOINT® TOOL GRINDER

for grinding all sizes and types of round and square shanked tools

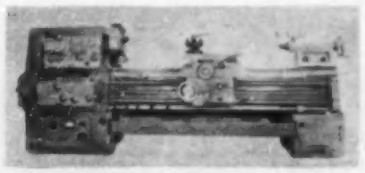
Automatic Tubular Riveter Takes Up to ⅛-in.-dia Fasteners

Model SMR Electrorivet is an all-electric bench type hopper fed unit specially designed for automatic feeding and setting of tubular rivets and other small fasteners at speeds of up to 60 per minute; 144,000 work cycles take 1.3 kwh of electricity.

Dimensions are: throat 4 in.; stroke 1⅛ in.; maximum shut height 7 in.; weight (including stand) less than 100 lb. It is mounted on a 2 x 3-ft maple top bench. Where careful control of the degree of clinch of the rivet is necessary, a variable transformer is available as an accessory enabling the unit to operate at any desired impact from a feather-light tap to its maximum rated capacity of 3500 lb.

Black & Webster Inc, 570 Pleasant St, Watertown 72, Mass

MORE DATA? Circle 86, inside back cover



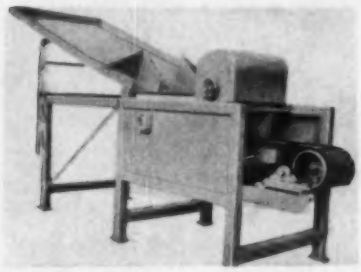
Italian Lathe Line Incorporates Improved Design Features

Clover lathes Models 20/30 and 22/33 with respective swings of 20 and 22 in. over beds now have hydraulic clutch and brake instead of the electromagnetic clutch and brake they had formerly. The 2 13/32-in. hole through the spindle is larger than on previous models.

Additional improvements include a coarse thread attachment multiplying all threads by three, the coarsest thread now being 1/3 tpi; totally enclosed quick change gear box; apron is now controlled by a double multi-disk clutch adjustable from the outside. In addition to automatic force feed lubrication in the headstock, these lathes are now equipped with automatic force feed lubrication for apron and bed ways.

Dist by Hermes Machine Tool Co, 48-15 Northern Blvd, Long Island City 1, NY

MORE DATA? Circle 87, inside back cover



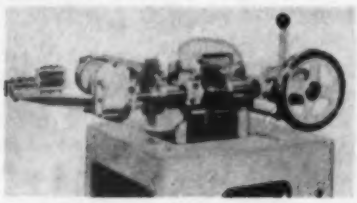
Magnetic Separator Removes Parts From Tumbling Media

Model MS-12U, with variable speed output, is capable of high-speed, mechanical separating of ferrous parts from finishing media. Separation is accomplished by a permanent drum-type magnet which pulls the parts up and out of the media mixture and deposits them on a moving conveyor belt for demagnetizing and delivery. Two types are available: 1) a completely integrated, hopper-loaded magnetic separator machine (illustrated), and 2) an attachable magnetic separator for use as an added accessory with existing screen separators.

The complete unit has a feed chute capacity of 12 cu ft, belt speed of 70 to 124 fpm, and is available in 12 or 9-in. belt width.

Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio

MORE DATA? Circle 88, inside back cover

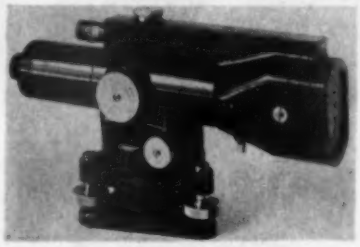


Straightener and Cutoff Machine Cuts Wire at up to 400 per Min

No. SC-00 straightens and cuts off short lengths of round wire up to 3 in. and in sizes up to 0.045-in.-dia basic wire (to 0.060-in. soft material) or its equivalent in ribbon metal in widths to ⅜ in. Lengths are cut off at rates up to 400 per min. Tolerance is held to ±0.002 in. on feed lengths and, using a secondary cutoff attachment, tolerance is maintained at 0.

A H Nilson Machine Co, 1400 Bridgeport Ave, Shelton, Conn

MORE DATA? Circle 89, inside back cover



Optical Level Maintains Line of Sight Automatically

A self-leveling device known as the Autoset automatically maintains a level line of sight even when its telescope is tilted. It consists of a fixed prism (which gives an erect image) rotating above two swinging prisms. When the telescope is tilted the suspended prisms change their relation to the axis of the telescope. Frictionless suspension assures a repetitive setting action closer than 1 sec of arc; oscillation of the prisms is eliminated by an air-damped piston which also limits swing to ± 20 minutes.

The instrument reads directly to 0.001 in. over ½ in.; its focusing range is 6 ft to infinity.

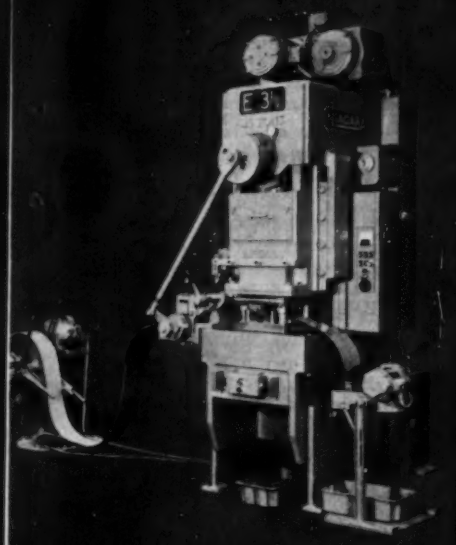
Dist by Engis Equipment Co, Div of Engrg & Scientific Instrumentation, 431 S Dearborn St, Chicago 5, Ill

MORE DATA? Circle 90, inside back cover

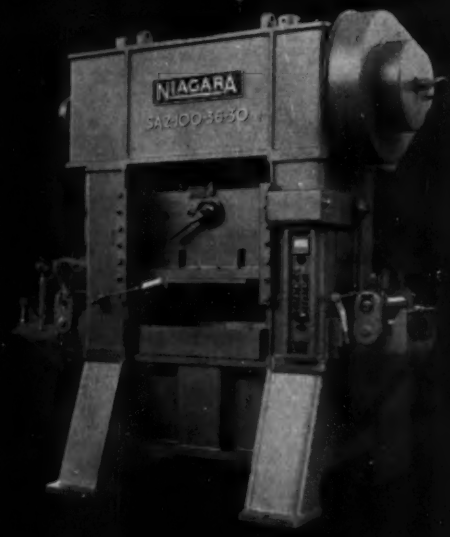
DIFFUSED AER-HEET CHAMBER supplies exact temperatures throughout all areas. Horizontal convection is employed to attain exact temperatures to a maximum 550 F across the entire area of each shelf—*Temperature Engrg Corp, Riverton, NJ*

MORE DATA? Circle 91, inside back cover

PRECISION PARTS BY THE MILLIONS



SERIES E — FRONT-TO-BACK CRANKSHAFT OBI's
Capacities: 45 to 200 tons.
45-ton model (above) stamps out fuse tips at rate of million/day.



SERIES SA-2 STRAIGHTSIDE AUTOMATICS
Capacities: 25 to 300 tons.
100-ton package (above) includes double roll feed, stock reel, scrap cutter.

SERIES M — ULTRA-HIGH SPEED OBI's
Capacities: 22 to 60 tons.
35-ton model shown operates at adjustable speeds up to 1000 spm and produces parts at rate of million/day.

3 great Niagara lines excel in automatic, high speed, progressive die work

Premium construction: It's the key to premium performance here! These modern Niagara presses are designed strictly for automatic, high speed, progressive die work.

Model for model, they'll turn out more parts per hour than conventional presses of equivalent tonnage can even approach. Far heavier and more massive, they have the ruggedness, rigidity, and stamina to run vibration-free at high speeds.

Providing more guiding surface, their gibbing holds slide and bed in precise alignment for precise production, longer periods between die grinds, and longest possible die life.

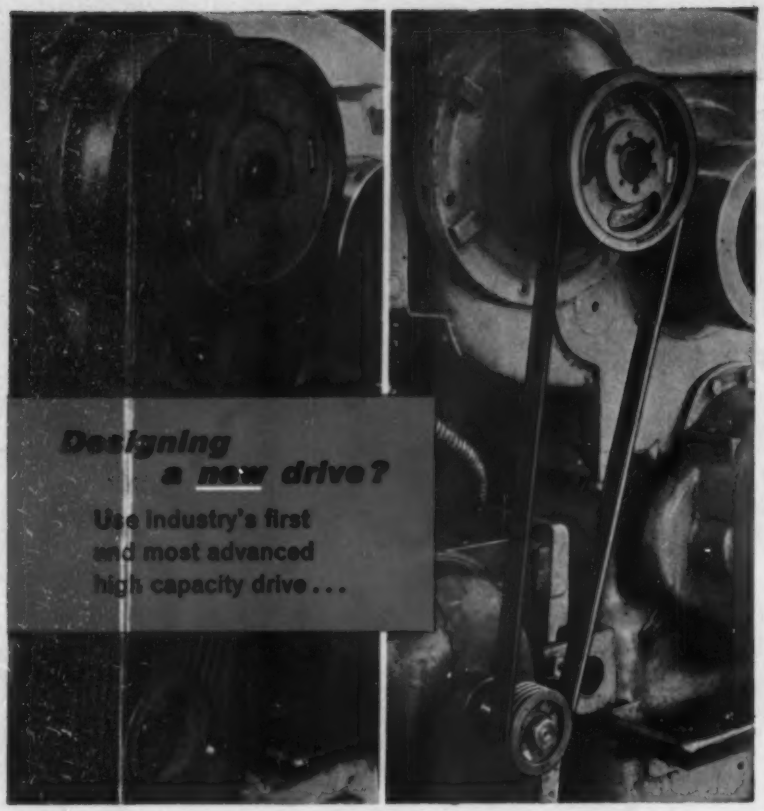
But this just begins to tell the story . . .

YOU'RE INVITED TO CHECK all the features of these production-boosting machines. Illustrated Bulletins 54 (Series M), 56 (Series E), and 264 (Series SA-2), will be mailed on request. Write: Niagara Machine & Tool Works, Buffalo 11, N. Y.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

CIRCLE 229 READER SERVICE CARD

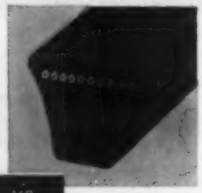


Gates Super High Capacity V-Belts save drive space, weight, money

If you are designing a new drive, or if the belts and sheaves of a conventional V-belt drive must be replaced, you will benefit many ways by installing a Gates Super HC High Capacity V-Belt Drive.

Gates Super HC V-Belt unites new, high performance materials with a basic change in the shape of the belt itself. Because of this, it is able to handle up to 3 times the horsepower of a conventional V-belt in the same space. As a result, Gates Super HC Drives can often cut in half the space required for your drive. Drive costs are cut as much as 20%, and drive weight reduced 20% and more. Guards can be smaller. Bearing loads are less, increasing bearing life. And the drive can operate at belt speeds up to 6000 ft/min without dynamic balancing!

There is a Gates Field Engineer serving your area. To contact him for help in designing a new drive, call your nearby Gates Distributor.



Exclusive design features include: precisely engineered arched top, concave sidewalls, Flex-Weave cover, super strength tensile construction.

Gates

Building the future on 50 years of progress

The Gates Rubber Company
Denver, Colorado

BP-7

Gates Super HC V-Belt Drives

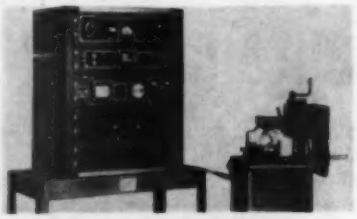
Apparatus for Galvanic Baths Is Equipped With Automatic Timer

An automatic swinging drum apparatus, manufactured in the Netherlands, incorporates an automatic timer to control the immersion time. Unit consists of two tanks, arranged one behind the other, with a rotating drum above. On top of the vertical partition between the tanks is the main shaft around which the drum rotates from tank to tank. The forward or sheet metal tank contains the rinsing water and the rear tank, which holds the galvanic bath solution, is lined with wire glass to suppress the generation of stray currents in the alkaline bath.

The pentagonal-shaped swinging drum is made of specially treated plastic and is designed with corrugated sides and slotted perforations to enlarge the active surface. The vaulted shape of the drum facilitates liquid exchange and serves as a preventive against flat objects adhering to the sides.

Dist by Netherlands Trade Commission, 551 Fifth Ave, New York 17, NY

MORE DATA? Circle 103, inside back cover



Single Frequency Testing Unit Inspects at 50 to 600 fpm

Eddy-current non-destructive testing equipment uses an oscilloscope presentation to indicate surface or subsurface flaws in non-ferrous nonmagnetic materials. It is reported to be equally adaptable to production line use or to a separate inspection operation. Materials ⅛ to 3 in. in diameter can be inspected at speeds

of 50 to 600 fpm. Twenty-four plug-in coils adapt the equipment for interim sizes in ⅛-in. increments.

False signals due to production machine vibration have been minimized while signal response to flaws is maintained at a high level. An additional neon light on the oscilloscope panel provides a supplementary visual flaw indicator.

Unit consists of the oscilloscope panel which can segregate flaws from background noise by phase angle deviation of the teardrop image on the screen; an in-put and power supply panel that provides regulation for the 110-v 60-c single-phase current and the B+ supply; a detector panel that contains necessary controls to operate at 2.5 or 10.0 kc.

Magnetic Analysis Corp, 42-44 Twelfth St, Long Island City 1, NY

MORE DATA? Circle 104, inside back cover

AC-DC Inert-Gas Welders Have Ranges From 1 to 410 Amperes

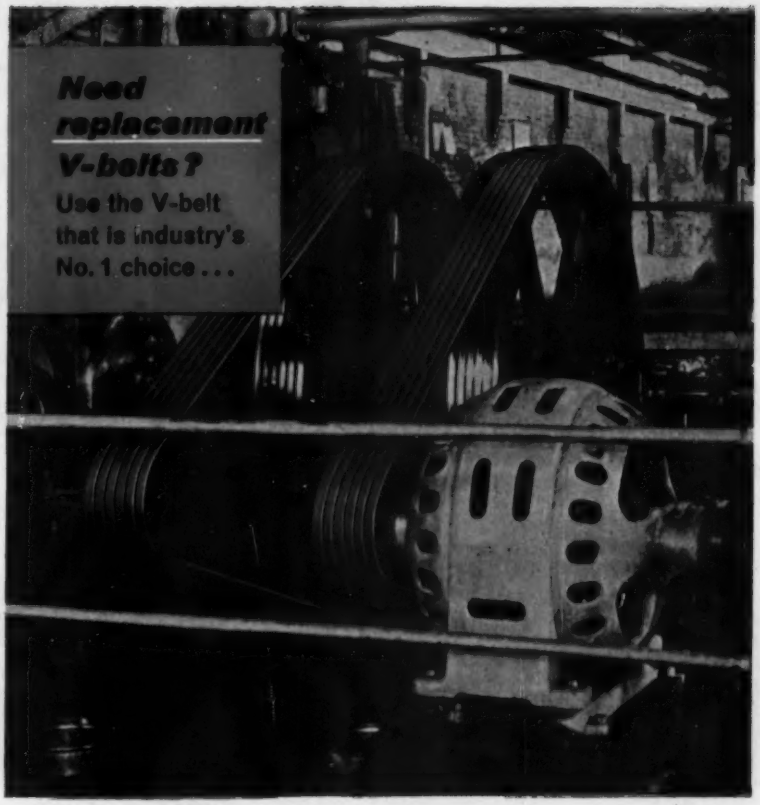
Two ac-dc, inert-gas-shielded-arc welders can be used for manual, automatic, tungsten inert-gas, inert-gas spot, and gas-shielded-arc consumable electrode welding. Both models have broad welding ranges which permit welding with as little as 1 amp of ac or dc welding current. Model ADI-2641 has an ac range from 1 to 300 amps, dc from 1 to 250 amps. Model ADI-3642 goes to 375 amps ac and 410, dc.

Both models have:

- Capacity to operate from single-phase 230/460 AC power
- Built-in inert-gas facilities
- Hinged top for easy access to spark gap and timers of high frequency stabilizer.
- Automatic contactor opening
- Hand switch for remote control
- Power factor corrections and ballast resistor to stabilize AC inert-gas welding.

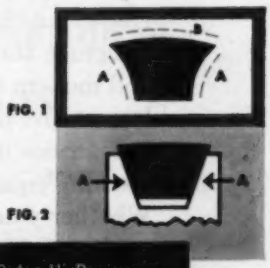
Hobart Brothers Co, Troy, Ohio

MORE DATA? Circle 105, inside back cover



Gates Hi-Power V-Belts give you longer service life on your drives

Concave sidewalls (U.S. Pat. No. 1813698)—It is easy to see why Gates Hi-Power V-Belts give far longer belt life than ordinary V-belts. *Just make this simple test:* Bend a Gates V-Belt as if it were going around a sheave. Feel how the concave sides (Fig. 1-A) *fill out* . . . become perfectly straight (Fig. 2-A) to make *full contact* with the sides of a sheave. The belt thus grips the sheave evenly, and distributes wear uniformly across the sides of the belt, lengthening belt life.



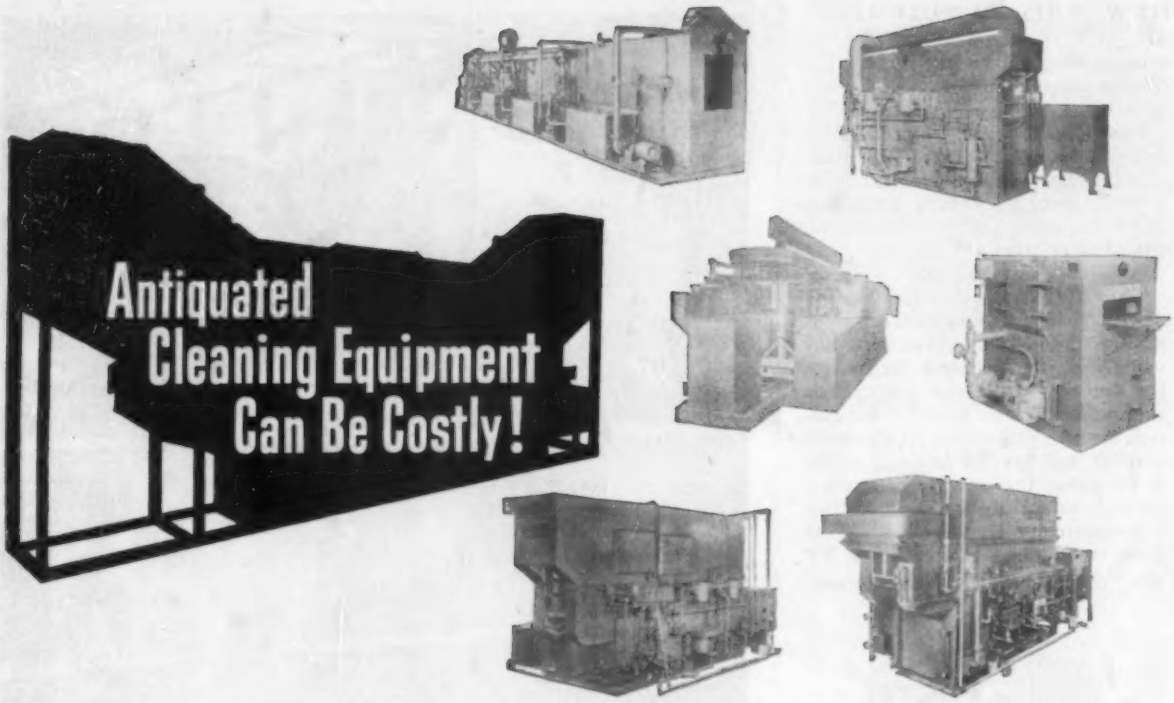
Precisely-engineered arched top—The arched top (Fig. 1-B) of the Gates Hi-Power V-Belt prevents any distortion of the tensile section cords as the belt bends around the sheave . . . the load is uniformly distributed with each cord carrying its full share.

You will get fast delivery of Hi-Power V-Belts from the local stock of your nearby Gates Distributor. Call him today.

The Gates Rubber Company
Denver, Colorado

BP-6

Gates Hi-Power V-Belts



Detrex will lease a machine to fit your needs exactly and economically!

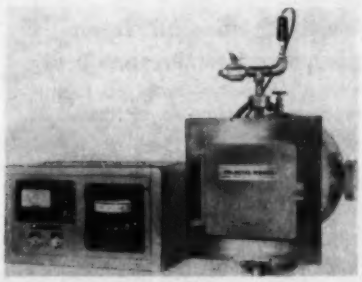
It is no accident that the Detrex nameplate is found on more cleaning equipment in more metal-working plants than any other—*by a wide margin.* Detrex has had more than 30 years' experience in designing this equipment—has the most complete and modern facilities for producing it—has the largest and most expert field force to help install and service it. And now you can lease any of your cleaning equipment requirements from Detrex. Whether you need a machine for degreasing, washing, rustproofing, phosphate coating, paint-bonding or paint stripping—whether you require equipment that is large or small—whether you desire a manual or automated operation—Detrex can supply your needs exactly and follow through with the service that means complete satisfaction.

Depend on DETREX for Every Metal Cleaning and Processing Need

- PERM-A-CLOR NA (Trichlorethylene)
- Solvent Degreasers
- Ultrasonic Equipment
- Industrial Washers
- Phosphate Coating Compounds
- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rustproofing Materials
- Extrusion and Drawing Compounds
- Spray Booth Compounds

DETREX CHEMICAL INDUSTRIES, INC.
Box 501, Dept. AM-261, Detroit 32, Mich.

World's Largest Exclusive Producer of Cleaning Chemicals and Equipment



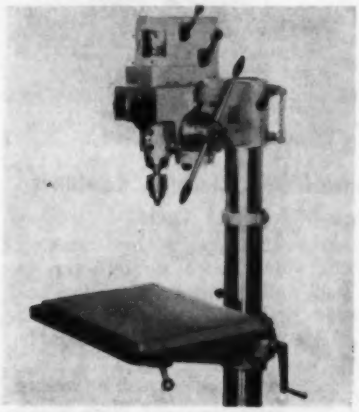
High-Vacuum Oven Can Operate At 0-500 C and 0-800 C

Line of cold wall (water cooled shell) bake ovens is capable of operating continuously at any temperatures within the ranges of 0-500 and 0-800 C. Temperature uniformity within the work zone is held to within ± 3 C.

The ovens are offered with or without one of several different vacuum pumping systems, depending on requirements. High vacuums of the order of 1 x 10^{-6} mm Hg at the elevated temperatures are attainable through the selection of the proper vacuum pumping system. Two oven sizes can be furnished: 8 x 8 x 14 in. and 14 x 14 x 16 in. (inside dimensions). Single and double end doors are available, all with flanges for dry box mounting.

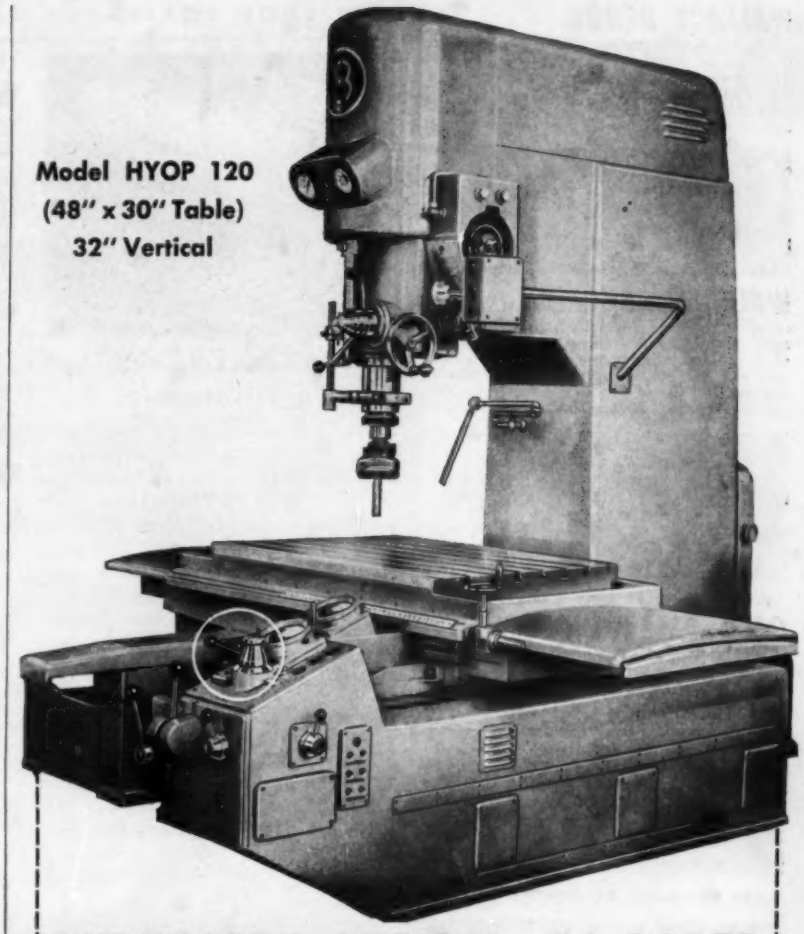
Tri Metal Works Inc, 1600 Bannard St, Riverton, NJ

MORE DATA? Circle 106, inside back cover



WORKTABLE (fourth of a line) for company's 18 and 24-in. geared head drillpresses is interchangeable with the other tables and incorporate the same rotating feature. Overall size is 25 x 20 in. outside a deep coolant trough completely surrounding the 22¼ x 17¼-in. finished work surface, underside of which is spanned by heavy ribbing—*Boice-Crane Co, 935 W Central Ave, Toledo 6, Ohio*

MORE DATA? Circle 107, inside back cover



Model HYOP 120
(48" x 30" Table)
32" Vertical

BURKHARDT OPTICAL JIG-BORER

—The most modern design—

•

Single Lever Control

•

No Gears, No Leadscrews

•

All Movements inf. Variable

•

5" Quill—8 HP Motor

•

LEITZ Optics 0.00005"

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Midwest's Leading Importer of German & Swiss Prec. Machine Tools

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serve outstanding metal fabricators the world over, many of them exclusively. The complete Wallace line includes ram benders, rotary and roll benders, automatic and manually operated, in the widest range available. For the job you do, Wallace builds the bender.

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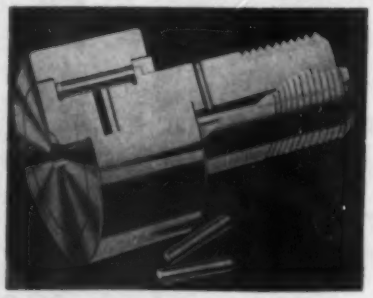


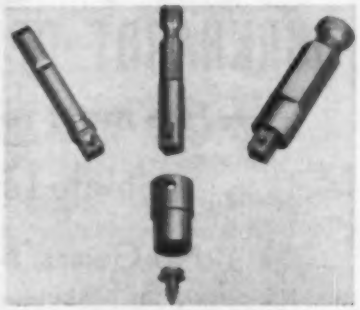
Heavy Stud Cam Follower Bearings Offered in Two Series

These first two series are now part of the regular Camrol cam follower line. The heavy-duty series was designed with increased diameter studs that provide greater shear strength to handle excessive stud deflection in critically loaded track, guide, support, and cam follower applications.

Included in the two series are the regular CFH models and SCFH models with integral seals. Both are interchangeable with standard cam followers except for the larger stud diameters. Roller diameter for both models start at 0.5 in., stud diameters from 0.25 in. Capacity range is from 470 to 20.750 lb at 100 rpm.

McGill Mfg Co, Bearing Div, Valparaiso, Ind

MORE DATA? Circle 108, inside back cover



Special Socket Offered for Self-Drilling, Self-Tapping Screw

The Apex M1AO8 is a magnetic socket specifically designed for driving self-drilling, self-tapping screws. It is made of special materials to enable it to withstand the stress and shock to which sockets are subjected when driving this type of screw, greatly reducing the amount of socket wear and breakage. The socket is used in conjunction with Apex extensions available in a wide range of shank types to fit all well known makes of power tools.

Apex Machine & Tool Co, 1025 S Patterson Blvd, Dayton 2, Ohio

MORE DATA? Circle 109, inside back cover

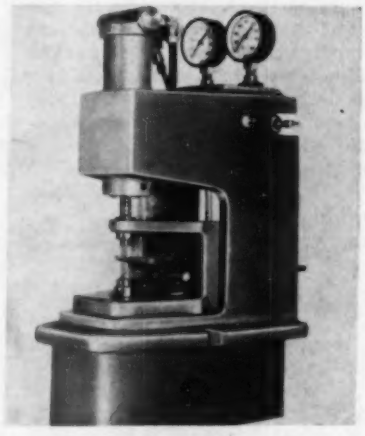
Lightweight, Inline Air Valves Cut Response Time, Pressure Drop

Headline series are reported to improve response time an estimated 20 to 30% above previous industry performance. This basic valve body also has the advantages of minimum pressure drop and long, trouble-free life. Poppets achieve full flow in short travel, have Buna N type resilient poppet seals designed to automatically compensate for normal wear.

The Headline, which may be air or solenoid-operated, is available in straightway, 3-way, and 4-way types from ¼ to 1½-in. pipe sizes. It conforms to JIC standards, handles air (or other fluid) pressures of 30-150 psig in the head and 5-150 psig in the body. Temperature range of service is 40-175 F with ambient air range from 40-120 F.

Ross Operating Valve Co, 120 E Golden Gate Ave, Detroit 3, Mich

MORE DATA? Circle 110, inside back cover



Bench-Model Machine Combines Press-Stake-Eject Cycle

Independent pressing and staking forces adjust from lightest tap to 1 ton, and adjustable ejector removes finished assemblies in this high-speed fully automatic assembly tool.

Standard interchangeable tooling fits removable C-holder diset which adapts to a wide variety of assembly operations; lower part of machine fits into workbench for convenient working height. Compressed air power and precision machining assure fast, accurate production from primary components and eliminate subassemblies as well as design and material limitations.

Cramer Controls Corp, Machine Tool Div, Centerbrook, Conn

MORE DATA? Circle 111, inside back cover

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Re-draw die uses 36 pieces of water-hardening tool steel

This large re-draw die shapes an intricate rear floor pan, made of sheet steel, for an American-made automobile. The die contains 36 pieces of Bethlehem carbon tool steel which serve as wear plates, inserts, keeper blocks, and insert plugs. The 17-ton die was produced in the shop of Modern Die & Tool Co., Utica, Mich.

The wear plates and inserts were hardened to Rockwell C 58-60; the keeper blocks and insert plugs to Rockwell C 50-52. The die maker liked the die for its easy machinability and ease of heat-treatment; the automotive manufacturer liked its resistance to wear and shock, and superior weldability when changes were required.

Due to their controlled hardenability, Bethlehem carbon water-hardening tool steels are ideal for applications calling for high shock-resistance. They are also resistant to wear, and have the toughness to withstand cold battering.

Your Bethlehem tool steel distributor can help you to find out how good a job Bethlehem carbon water-hardening tool steel can do. And he can give you good advice on the selection of other fine Bethlehem tool steels. Give him a call now!

BETHLEHEM TOOL STEEL ENGINEER SAYS:

"Touchy" Tools Should Be Ground On Edge of the Grinding Wheel

A choice of grinding methods is often available on many types of tools. They can be ground either on the side (face) of a grinding wheel in order to cover the whole area to be ground; or they can be ground on the edge (OD) of the wheel by traversing a number of parallel paths to cover the area selected for grinding.

Where the tools to be ground are exceptionally high in hardness, or if they are made of wear-resisting steels, or if there is a history of sensitivity to grinding cracks, edge-grinding is definitely best. The use of a grinding fluid for effective cooling is also essential.

By grinding on the edge of a grinding wheel, only a small area of the wheel is in contact with the tool at any moment. This permits more effective cooling action of the grinding fluid than when a large area of the wheel contacts the tool.

Cromo-High V (H-13)

Ideal for Die Casters

Die casters everywhere are getting fine results from Bethlehem Cromo-High V (H-13) tool steel. This 5 pct chrome-moly hot-work grade is furnished with 1 pct vanadium, and has all the features for good die-casting dies. Cromo-High V has good resistance to wash and erosion, and is plenty tough. It comes uniformly annealed for easy machinability. In addition, Cromo-High V has good center density and grain refinement, and resistance to heat-checking.

CIRCLE 335 READER SERVICE CARD

Finishing Unit Occupies Only 4.8 sq ft of Floor Space

Deburring and finishing machine, the Model DB-1616 Space Saver, can handle a wide variety of metal parts. Choice of barrel sizes permits a large or small number of items to be easily processed by the operator.

Total capacity of the two-compartment barrel is 2 cu ft, each octagonal container measuring 16 x 8 in. A single compartment barrel measuring 16 in. in length and diameter is available as optional equipment. Barrels are lined with ¼-in.. abrasive-resistant plastisol. The barrel is rotated by a ½-hp 220/440-v 3-phase 60-c motor, manually operated by switch with overload protectors. Speed is variable from 13 to 39 rpm. Overall size of the unit is 28 in. in length, 25 in. in width and 50 in. in height.

Almco Precision Finishing, Queen Prdoucts Div, King-Seeley Corp, Albert Lea, Minn

MORE DATA? Circle 112, inside back cover

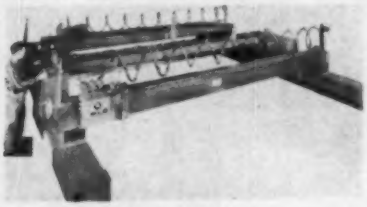
100-w Ultrasonic Generator Fits Wide Range of Jobs

The Inson 100 PW has connections for any of ten output impedances which may be selected from a broad range to match any requirement. Any nominal frequency may be specified from 10 to 100 kc or greater. The wide range of output values suits the unit to ultrasonic welding, soldering, splicing, and sealing of metals and plastics; ultrasonic cleaning and drilling; and use with processing cylinders or other specialized transducers.

Power output is continuously variable from zero to full power. Frequency range of the standard model is 35-45 kc and impedances are 17.5 to 20,000 ohms. The unit may be used with piezoelectric or magnetostrictive transducers. Price is $675 fob.

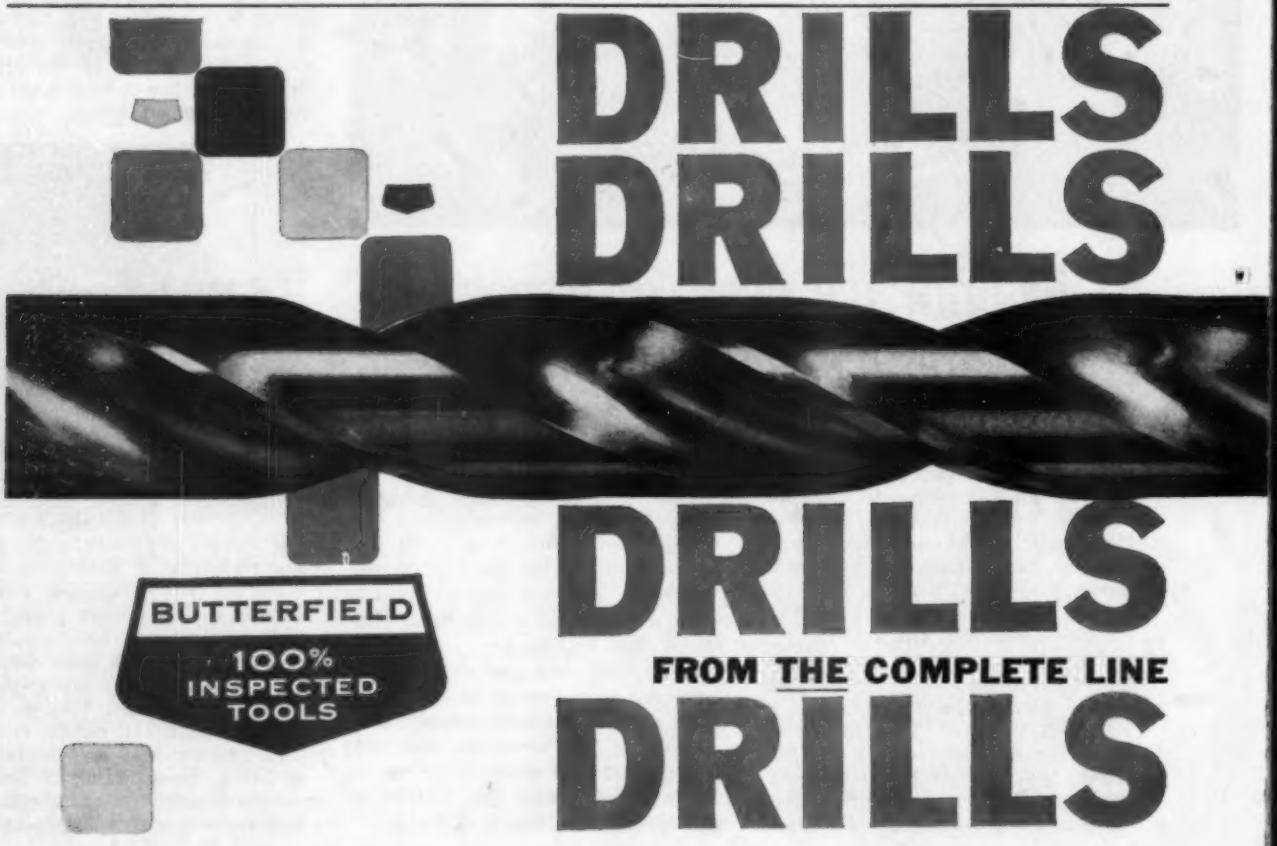
International Ultrasonics Inc, 1697 Elizabeth Ave, Rahway, NJ

MORE DATA? Circle 113, inside back cover



Flame Cutter Handles Plate Up to 20 ft Wide, Any Length

Multiple-head cutter which uses the company's standard saw gantry has an unlimited capacity for squaring

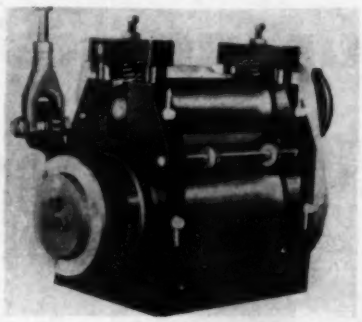


large plate sizes, scarfing, beveling, and edge preparation to close precision tolerances. It can be converted to a straight-line automatic welding rig. The gantry unit is recommended for use with two rod trimmers which also travel on the rails with the gantry and provide cross-cut trimming by means of a movable blow pipe which travels along the transverse rail on roller bearings. The gantry ripping unit can be fitted with up to eight variable-angle blow pipes for production multiple cutting.

Track travel consists of a Thy-Mo-Trol infinitely variable speed drive through a synchronizing cross shaft and a rack and pinion drive to each rail. It is all pushbutton controlled with speed indicator in inches per minute feed, and has a 100-fpm rapid traverse rate. Tracks are available in any length. The end trimmers are moved down the tracks by a handwheel and are kept in absolute square by rack and pinion drive and cross shaft. This unit can be furnished with variable speed track drive for cutting in both directions.

Ty-Sa-Man Machine Co, 1001 White Ave, Knoxville, Tenn

MORE DATA? Circle 114 inside back cover



Automatic Precision Roll Feed Redesigned by Benchmaster

New design incorporates a long-life cam clutch which transmits greater torque with reduced wear and high repetitive accuracy. The lower feed roller is a full 3⅞-in. diameter producing a nominal 3½-in. stock travel with less than 1/3 of the full roller circumference. No gearing is employed in the series 3.5 PRF which eliminates backlash and improves overall feed accuracy.

Two series are available, both in sizes having rollers to handle 3, 5, 7, and 9-in. stock widths. Series 3.5 PRF feeds up to 3½ in. in length with a feed accuracy of ± 0.005 in. reported to be easily obtainable. Series 9 PRF feeds 0-9 in. per stroke with slightly less accuracy due to the longer feed length.

Benchmaster Mfg Co, 1835 W Rosecrans Ave, Gardena, Calif

MORE DATA? Circle 115, inside back cover

150-kv X-Ray Machine's Tube Has 3-mm Focal Spot

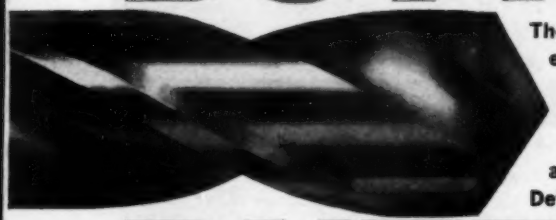
Machine is reported to be capable of producing sharper pictures because of the tube's 0.012-in. focal spot, the smallest of any X-ray unit, according to manufacturer. The unit has a rotating anode tube with a continuous rating of 6 ma at 150 kv, twice the output of a stationary anode tube.

Counterweighted 3-in.-sq mast eliminates vibration and assures clear images. The mast can be pivoted 360° and fits under an 8-ft-high ceiling. The unit also has a telescoping tube arm that provides 16-in. cross travel, and an axis for complete rotation of the tube hanger.

Picker X-Ray Corp, 25 S Broadway, White Plains, NY

MORE DATA? Circle 116, inside back cover

BUTTERFIELD
BUTTERFIELD

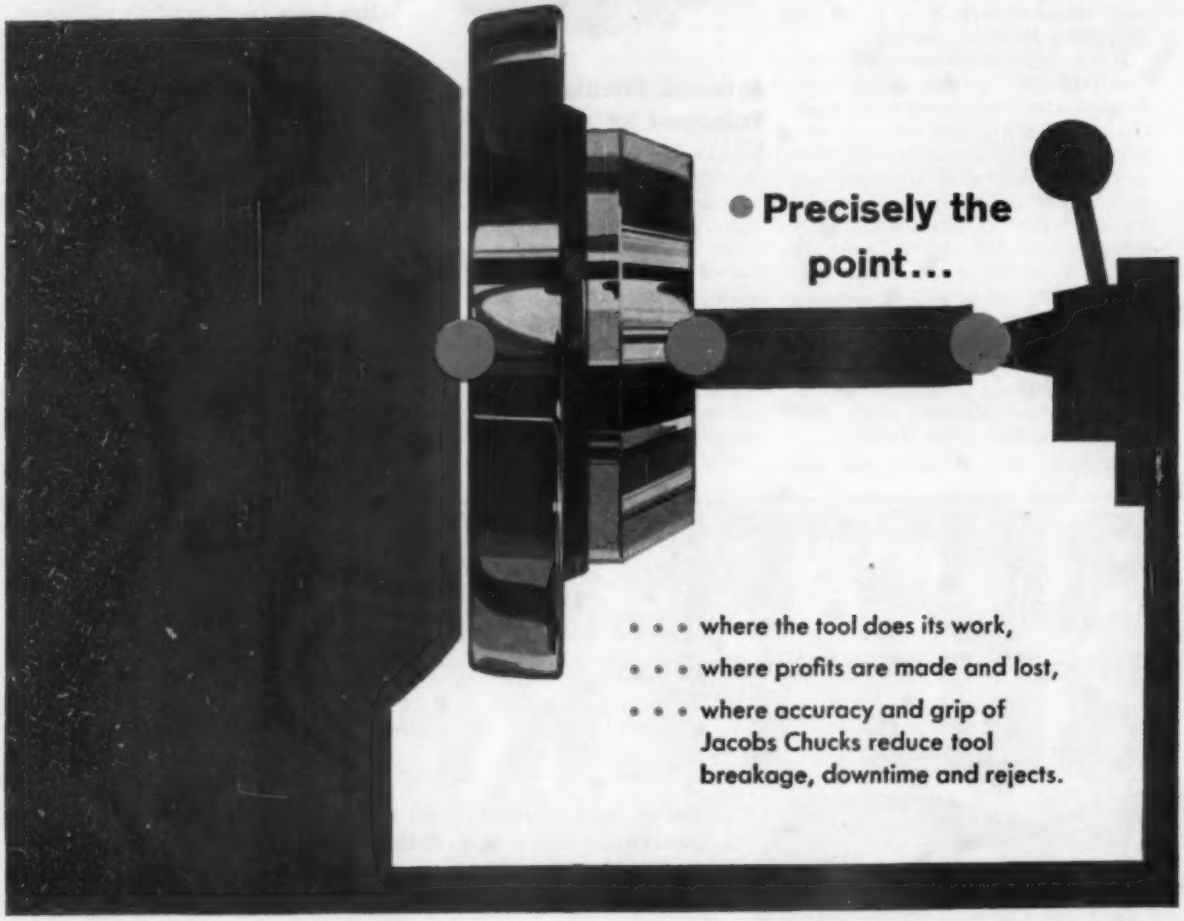


The outstanding performance and tool life of Butterfield drills are engineered into the complete Butterfield line — for best results when any cutting tool is used alone, and for smooth teamwork in multiple tool machining. Whatever you machine, wherever you're located, get these advantages, backed by fast deliveries and expert technical aid . . . Call your Butterfield Distributor. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco.

BUTTERFIELD
DIVISION, UNION TWIST DRILL COMPANY, DERBY LINE, VT.
BUTTERFIELD

When you buy new tools or four factors come first

ACCURACY GRIP


• Precisely the point...
• • • where the tool does its work,
• • • where profits are made and lost,
• • • where accuracy and grip of Jacobs Chucks reduce tool breakage, downtime and rejects.

The Jacobs Model 50 is the world's most modern collet chuck. Model 50 and its entirely new series of Jacobs Rubber-Flex collets have been developed especially for Atlas, Clausing, Delta, Logan, Sheldon, South Bend and similar lathes. With Model 50 on your lathe you get a lot more for less.

ACCURACY is greater with Model 50 because collet jaws are always parallel and maximum run-out is .001″ T. I. R. at the nose, when properly mounted.

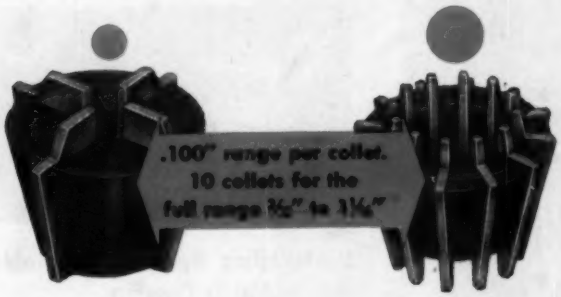
GRIP is greater because the extra long collet jaws have tremendous torque capacity.

modernize your old ones at the chucking end

RANGE PRICE

COMPLETE SET OF 10 RUBBER-FLEX COLLETS CHUCK ANY BAR BETWEEN 3/32" and 1 1/16"

RANGE is greater because the 10 Rubber-Flex collets in this new series cover a greater bar stock range than **63 old-fashioned split steel collets** . . . .100" range per collet.



PRICE **is revolutionary!**

$70.00 Model 50 Collet Chuck

$65.00 Complete set of 10 Rubber-Flex Collets

This performance at these prices proves the point. You can't afford not to modernize your lathes with Jacobs Model 50 and Rubber-Flex collets.

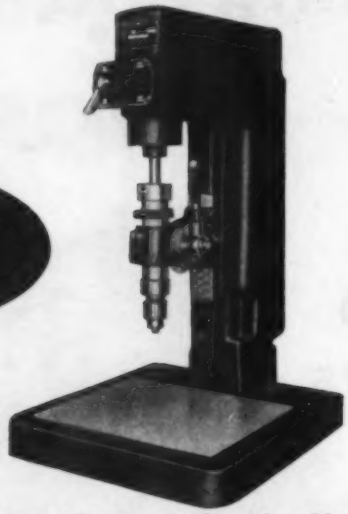
See your Jacobs industrial supply distributor. Give him the opportunity to prove the facts with a demonstration at your desk! Call him today. If you'd like further details before you call, write Jacobs, Department 196 at the address below.

Jacobs CHUCKS

THE JACOBS MANUFACTURING COMPANY,
WEST HARTFORD, CONNECTICUT

production drill for precision holes

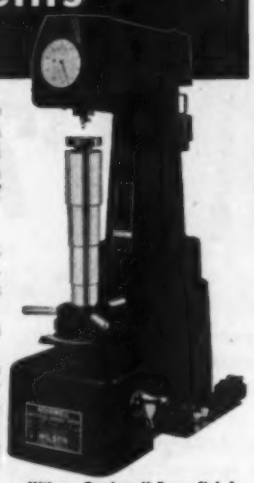
Avey



Let us show you how to knock hours off your production and precision drilling with this MA-8. Capacity to ⅜". Eight spindle speeds with 10:1 range (variable speeds optional). Hand feed or air hydraulic. 12" swing. Column or bench type. One to six of our famous precision spindles, which give you quiet, vibrationless speeds up to 12,000 rpm. Send for Bulletin 857 or phone us. Avey, Box 1264, Cincinnati 1, Ohio.

CIRCLE 240 READER SERVICE CARD

Wilson "Superficial" makes Shallow Measurements Accurately



Wilson Rockwell Superficial hardness testers are used to measure surface hardness, coatings, thin metal or thin hard cases. The hardness test is based on a penetration of less than .005", and Wilson Superficial testers have the precision and ease of operation to give accurate readings every time.

Accurate—Precision-built for consistently correct results. Knife-edge bearings provide near-frictionless operation.

Easy to operate—Controls conveniently grouped—oil dash-pot system provides smooth load application.

Long lasting—Simple design, rugged construction make Wilson Superficial testers as durable as a machine tool.

Complete line available—Wilson Rockwell hardness testers and accessories are available in a wide variety for every hardness testing function. Also "Brale" diamond penetrators for perfect readings every time.

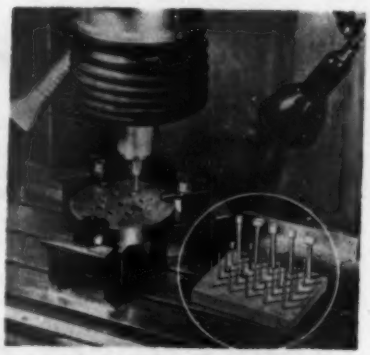
Write for details—Ask for Catalog RT-58. It gives complete information on the Superficial tester as well as on the full line of Wilson Rockwell hardness testers.

Wilson Rockwell Superficial Hardness Tester

WILSON "ROCKWELL" HARDNESS TESTERS

ACCO

Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-B Park Avenue, New York 17, New York



Titan Line of Diamond Pins Expanded to 25 Sizes

Jig grinding, internal grinding of small holes, and other precision grinding operations is simplified because in the smaller sizes the pins are available in 0.010 intervals.

All 25 sizes are available in two grit sizes. The larger 80/100, coarser than normally available, is suited to applications where rapid cutting action and greater production is desired. The trade standard 200/240 grit is available where finished quality is critical. The pins are furnished in cylindrical shapes, as shown, from sizes of 0.20 diameter to 0.500.

Titan Tool Supply Co, Box B, 1419 Hertel Ave, Buffalo 16, NY

MORE DATA? Circle 117, inside back cover

Die-Handling Hydraulic Lift Table Has 20,000-lb Capacity

The table pictured is 4 x 10 ft. Wheel equipment has a polyurethane tread and all four wheels are casters. The table, which is also equipped with floor locks, raises from a 30-in. lowered height to a 42-in. raised height. Power is transmitted by means of four hydraulic rams.

A 1-hp gear motor powers the double-drum winch that transfers the dies from table to press and vice versa. A double countershaft connects the two drums, each of which has its own cable, two snatch blocks, and a hook.

West Bend Equipment Corp, West Bend, Wis

MORE DATA? Circle 118, inside back cover

For the deepest draws on the toughest metals

Johnson's 700 WAX-DRAW does every draw in the shop. *Easy to apply* by roller coating, spraying, dipping, etc. Use wet or dry. Blanks can be fed directly into the press or may be pre-coated, dried and palletized. *Easy to remove*, using solvent bath, vapor degreaser, alkaline washer or even hot water alone. *Money saving.* One gallon undiluted covers 2,000 square feet. Four-to-one dilutions produce excellent results. 700 Wax Draw handles multiple draws with only one application even at pressures to 200,000 p.s.i. and temperatures to 450°F.

For further information write: **JOHNSON'S WAX** Racine, Wisconsin, Dept. AM-2.

GET THIS NEW
Complete Line
AMERICAN
TWIST DRILL
CATALOG

98 Pages

HIGH SPEED STEEL TWIST DRILLS
CARBIDE TIPPED TWIST DRILLS
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DRILLS FOR HARD STEEL
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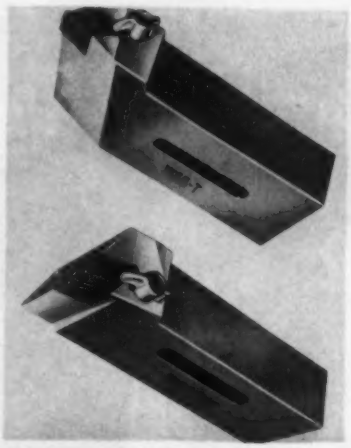
AMERICAN

Write:
AMERICAN TWIST DRILLS
A Subsidiary of
Brown & Sharpe Mfg. Co.
14301 West Chicago Blvd.
DETROIT 28, MICHIGAN



Tracer Lathe Toolholder Eliminates Insert Shifting

The Wil-Dex indexable tracer lathe toolholder eliminates problems of insert shifting. The cutting insert is secured in position by a cam-lock that pulls the carbide insert back into the insert pocket with a simple Allen wrench adjustment and locks it against the pocket walls, making insert movement during operations impossible. Varying and alternating cutting pressures will not change the insert position.

In addition, the indexable diamond shaped insert (0.625 IC x ¼ in. thick as compared to the 0.464 IC x 1½-in. long carbide slug) conducts the heat away from the cutting edge faster. The inserts are indexable four times. Eleven standard sizes are available. *Willey's Carbide Tool Co, 1340 W Vernor. Detroit 1. Mich*

MORE DATA? Circle 119, inside back cover

MONOBUFF, a dual-purpose cut-and-color buff, combines fast-cutting characteristics of a sewed or bias-type buff and high-coloring properties of a loose buff. It is furnished in full cloth; cotton pieced; and sisal with cotton covers and is available in standard diameters of 14 to 20 in.; metal centers are 5, 7, or 9 in., fixed or removable—*Midwest Buff Mfg Co, 2515 E 79th St, Cleveland 4, Ohio*

MORE DATA? Circle 120, inside back cover

Precision Requires Gages to Suit the Job-

that's why FEDERAL *offers such a variety of Gages!*

Inside and Outside CALIPER GAGES

Specially shaped arms of various lengths can be designed to reach inaccessible spots or get around obstructions.

Standard Model 149P-20 1" to 3"

Standard Model 49P-1 0" to 3"

Just *any* gage is not good enough. Some dimensions require a higher degree of accuracy than others. And some dimensions cannot be reached directly. Still others need ranges or adjustments to give greater gage capacity.

It's easy to check a dimension with a Federal Gage — and it's the quickest and least expensive way. Just call Federal and get the *right* gage for your job.

FEDERAL PRODUCTS CORPORATION
1122 Eddy Street, Providence 1, R. I.

HOLE LOCATION GAGES

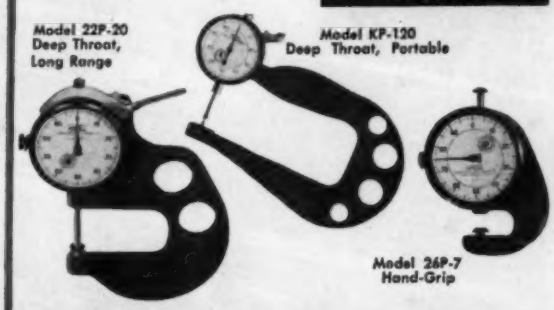
Series 205 Gages accurately check hole location and concentricity. Also adaptable to applications involving hole and surface relationships.

Typical Series 205 Gage (12 Basic Models)

Squareness and location of holes in three mating parts of pump are checked to determine alignment within .0001".

ALL TYPES OF THICKNESS GAGES

Many styles and sizes, for portable and bench use.



Model 22P-20 Deep Throat, Long Range

Model KP-120 Deep Throat, Portable

Model 26P-7 Hand-Grip

BENCH TYPE THICKNESS GAGES and SMALL COMPARATORS

Model 578-1 Long 1" Range

Model 691B Deep throat. Weight, for compressible materials, assures uniform measuring pressure.

Model 358-B Adjustable Table

OVER 10 TYPES OF COMPARATORS

Model 1308-9 Electronic Comparator, Ball Bearing. Detects one millionth.

Model 136 I.D. — O.D. Electronic Master Comparator Detects one millionth.

Whatever You Need in Gages . . .

Ask **FEDERAL** *First*

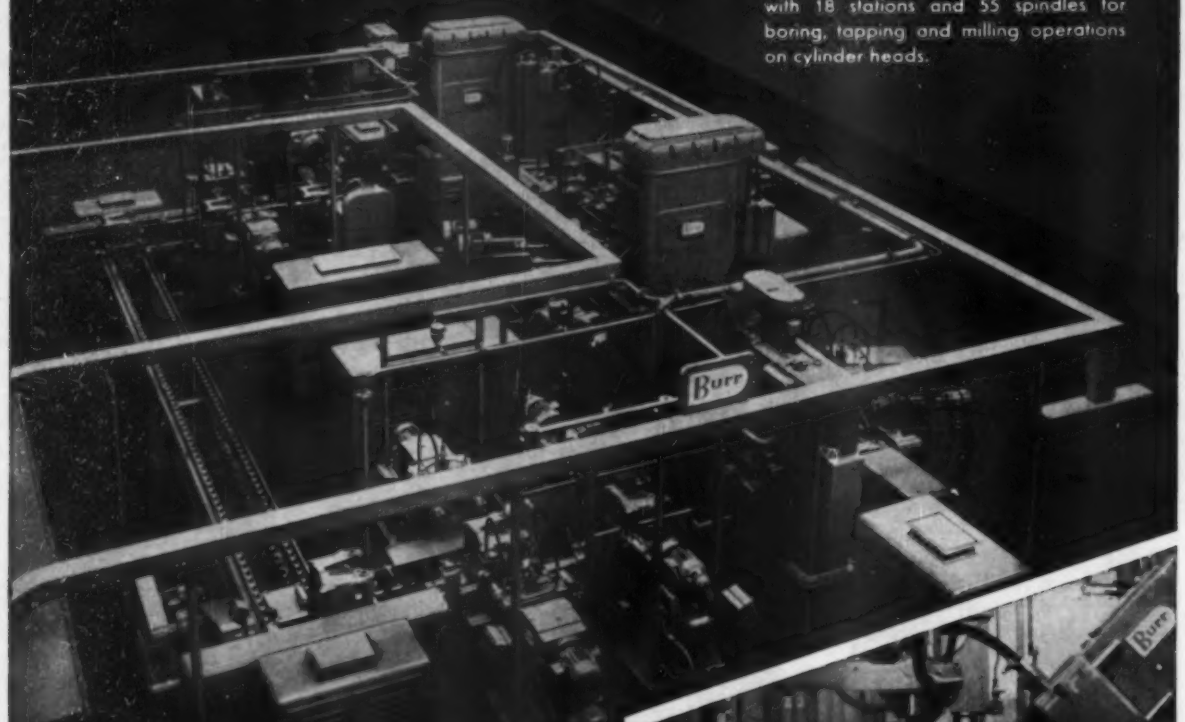
MANY OTHER TYPES

Send for Catalog showing most complete line of Dial Indicator Gages.

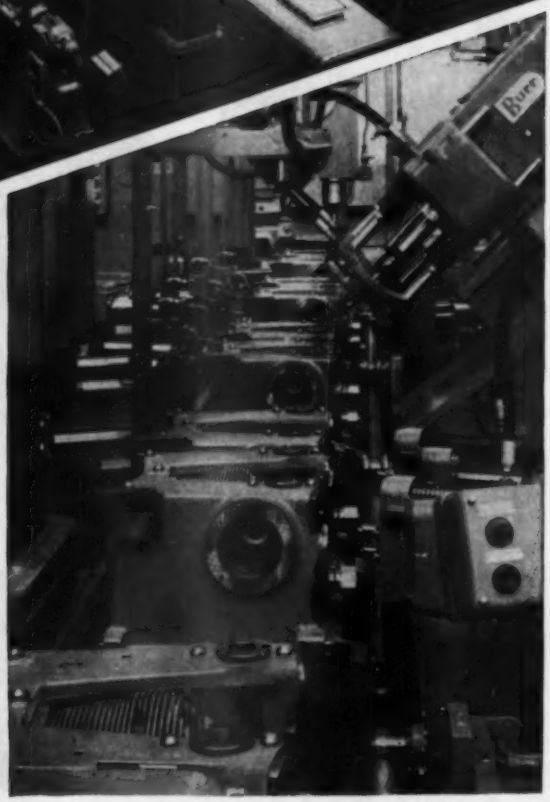
GAGES CAN BE SPECIALLY MODIFIED TO SUIT . . .

Burr TRANSFER MACHINES

TRANSFERLINE
with 18 stations and 55 spindles for boring, tapping and milling operations on cylinder heads.



60 Components per hour
Machined on 5 sides



LUDWIGSBURGER MASCHINENBAU GMBH.
LUDWIGSBURG (WÜRTT.) GERMANY

GE to Up Spending and Hiring In Western States

General Electric plans to spend more than $9 million for new plants and equipment and will employ 1000 more workers in ten western states during the coming year. This is in addition to the 1000 added and the $7 million investment made during 1960, according to C C Walker, western region vice president. He reports that the company in 1960 invested $135 million in new plants and equipment nationally, a rise of nearly 50% over the $91 million spent in 1959.

Major western areas for company spending and new employment will be Phoenix, San Jose-Pleasanton, the Seattle and Portland areas, and Salt Lake City. The five big growth areas are atomic power plants and other new energy conversion processes; stationary gas turbines and commercial jet engines; industrial automation; computers; and space.

SKF Buys Nice

Assets of Nice Ball Bearing Co, a division of Channing Corp, have been acquired by SKF Industries, Philadelphia. Acquisition adds an entirely new line of bearings to SKF products. Nice, which employs about 800 in plants located in Philadelphia and Lansdale, Pa, will continue to operate as an entirely independent organization.

Hughes Plant to Hire 2500 More in 1961

Hughes Aircraft Co's Fullerton, Calif, plant will add more than 2500 employees to its present 6500 during 1961. The facility is engaged in electronic engineering development and manufacturing and work is in progress on 41 defense contracts. The plant has just received a $20.9 million order to build an undisclosed number of "operations central systems" which comprise "the heart of a mobile, vest-pocket tactical air defense network" for use with armies in the field.

Mechanical engineering students work on machine tools at the Hong Kong Technical College built on a dollar-for-dollar basis by the Government of Hong Kong and industrialists in the Colony. The college comprises a classroom block with accommodation on its five floors for departments of building, mechanical engineering, textiles, commerce, electrical engineering, mathematics and physics, and navigation. More than 600 students are enrolled in full-time courses and 6600 others attend part-time day release and evening classes

$18 Million Shipbuilding Program Launched by Canadian GE

Canadian General Electric Co Ltd has scheduled a major program—an unexpected stimulant to the Canadian shipbuilding industry. Work has already started on a 25,000-ton bulk carrier being built by the Saint John Shipbuilding & Dry Dock Co at St John, New Brunswick. The company estimates it can employ 2000 men on the CGE and other jobs. Another 25,000-ton carrier and two smaller freighters will be built by Canadian Shipbuilding & Engineering Ltd at Collingwood, Ont. About 900 men are employed at the Collingwood yard and the three-ship construction is expected to keep the yard going for three years. And the CGE plant at Peterborough, Ont, will start making marine steam turbine drives. It'll be the first time such large units have been built in Canada, and will occupy 3000 at the facility. The program will halt layoffs in both centers. Shipyards in the Great Lakes and Montreal areas had reached the end of their orders and the Collingwood yard might have been idle by next summer.

Studebaker Joins Other Firms In Forming Missile Company

Studebaker-Packard Corp is joining three other companies in creating a a new space and missile industrial concern. Companies are Amcel Propulsion, Asheville, NC, subsidiary

McGIRK'S WORKS

by GEO CRENSHAW

EXACTLY WHY DO YOU WANT YOUR BADGE CHANGED TO THIS PARTICULAR NUMBER ?
NO SPECIAL REASON. IT'S JUST KIND OF A SENTIMENTAL NUMBER I'D LIKE TO HAVE.
PLANT SECURITY
IT'S AN UNUSUAL REQUEST, BUT I GUESS IT'LL BE OKAY.
36-22-34
MOE'S CORNER
PLANT ORDINANCE #8274: Employees' badges will be worn conspicuously so as to be plainly visible at all times.

MAGNESIUM JIG CUTS COST OF DRILLING CASTINGS $3.08 PER UNIT!

By using magnesium tooling plate in place of steel, Worthington Corporation reduced the weight of tumble drill jigs from 125 pounds to 35 pounds. Used for close-tolerance drilling of castings, the magnesium jig can be turned by hand instead of by a chain hoist required for the heavier steel jig. This means a saving of $3.08 on every casting processed through the jig. And fabrication cost of the magnesium jig is 60% less than that of a steel jig.

Magnesium tooling plate can result in savings in your production operations. Its lightness, flatness, machinability and dimensional stability are ideal for fabricating accurate, easy-to-use jigs, fixtures, templates, gages, and for other tooling uses. For more information, write THE DOW METAL PRODUCTS COMPANY, Merchandising Dept. 1103F2-6, Midland, Michigan.

DOW **THE DOW METAL PRODUCTS COMPANY**

Division of The Dow Chemical Company

CIRCLE 247 READER SERVICE CARD

DOW

GET FAST DELIVERY OF MAGNESIUM TOOLING PLATE FROM THESE DISTRIBUTORS

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Clendenin Bros., Inc.
EAstern 7-4500
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Hubbell Metals Inc.
EDison 4-5385
Chicago, Illinois
Fullerton Metals Co.
MErrimac 7-2700
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FEderal 1-4311
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Copper and Brass Sales, Inc.
EMpire 1-6681
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TUxedo 8-8424
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STate 7-1341
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BAltimore 1-7760
Louisville, Kentucky
Hubbell Metals Inc.
MElrose 7-2595
Los Angeles, California
Reliance Magnesium Company
LUdlow 3-6361
Lyndhurst, New Jersey
A. R. Purdy Co., Inc.
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WHitehall 8-1661
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HUmboldt 1-6900
Minneapolis, Minnesota
Fullerton Metals Co.
STerling 1-3456
Portland, Oregon
Eagle Metals, Inc. of Oregon
ATlantic 8-5201
St. Louis, Missouri
Hubbell Metals Inc.
FRanklin 1-0212
Seattle, Washington
Eagle Metals Company
PArkway 3-9974
Spokane, Washington
Eagle Metals Company
KEystone 4-0586

THE DOW METAL PRODUCTS COMPANY

DOW

CIRCLE 248 READER SERVICE CARD

Technology Instrument Corp, Acton, Mass; and Merz-Chambers, Indianapolis producer of ground support equipment.

New company will be known as United Systems Corp and will seek prime defense contracts. Studebaker's CLT Division, which is participating in the new organization, built the nose cone for the Jupiter C missile in which monkeys Able and Baker were returned safely from space.

Automatic Welding Co Acquired by McKay

McKay Co, leading manufacturer of welding electrodes, welding wires, chain and chain products, has purchased the Automatic Welding Co of Waukesha, Wis, and will operate it as a wholly owned subsidiary. McKay, headquartered in Pittsburgh, with manufacturing facilities in York, Pa, also owns Surface Chemicals Inc, processor of alloy and stainless steel wires in Greensburg, Pa. The new McKay subsidiary specializes in making welding equipment for automatic hard surfacing.

$28 Million Orders to Raytheon

The IBM Space Guidance Center at Owego, NY, has awarded contracts to Raytheon Co, Waltham, Mass, for work on advanced radar systems for the AF B52 bomber. The work is part of a four-year production and engineering program for the aircraft. Of the contracts, $23 million is for production and about $5 million for tooling and special test equipment.

Porter Closes Detroit Plant

H K Porter Co of Pittsburgh has moved its manufacturing operations in Detroit to its Frankfort, Ky, facility. Competition and high wages in Michigan reportedly forced the relocation. Closing affects about 450 hourly workers and 30 of the office force. The Detroit plant specialized in automotive and metal moldings and was formed as an auto supplier in 1924.

New Consulting Firm Provides Value Analysis Training

Value Programs for Industry Inc has been organized in Schenectady, NY, as a professional consulting firm to provide VA training and consulting services to industry. In addition to supplying scientific value training, it'll offer services in product and business evaluations, training in idea generation and development, value clinics for sales executives, and programs for the rejuvenation of existing cost reduction activities.

The company was organized by and will be under the direction of R E Fountain as president and John F Prendergast as vice president. Both men have been professional value specialists in operating departments of General Electric and have been in charge of the entire GE Value Analysis training program. Between them they have managed 54 company-wide VA seminars training over 5000 technical and management personnel.

Oberg Forms Partnership With British Firm

Oberg Manufacturing Co, a leading producer of carbide dies located in Freeport, Pa, and Joseph Sankey Co Ltd, London, have formed a new firm, Oberg-Sankey Ltd, for production of carbide dies at Dudley, England. Set up to service foreign markets, the new American-British plant will start production in April. The Sankey organization, said to be the world's largest producer of laminations, has plants in South Africa, India, and Australia as well as in England. Prior to the partnership, the British company was a major customer of Oberg's carbide dies.

Canadian Ramblers Rolling

First car built by American Motors (Canada) has rolled off the company's new $3.5 million assembly line at Brampton, Ont. Full production of 32 cars a day will be reached

". . . then looking him straight in the eye I said, 'You can't transfer me to another department, Charlie! Who'd take me?'."

WALKER CERAMAX

TURNING

Walker, for the first time in machine tool history, offers safe magnetic holding for lathes. Ceramic magnets in Walker Rotary CERAMAX chucks are not subject to electrical power failure and have three times greater coercive force than ordinary Alnico magnets. With uniform holding power over the entire face of the chuck, safe, accurate turning, facing or trepanning is accomplished in a single set-up.

GRINDING

Walker CERAMAX chucks provide all the holding power needed for standard grinding operations and with fine pole divisions are ideal for thin, small work as well as large, heavy pieces. All-steel top plate minimizes redressing to reduce non-productive machine time. Ceramic magnets retain magnetism permanently, eliminate constant recharging.

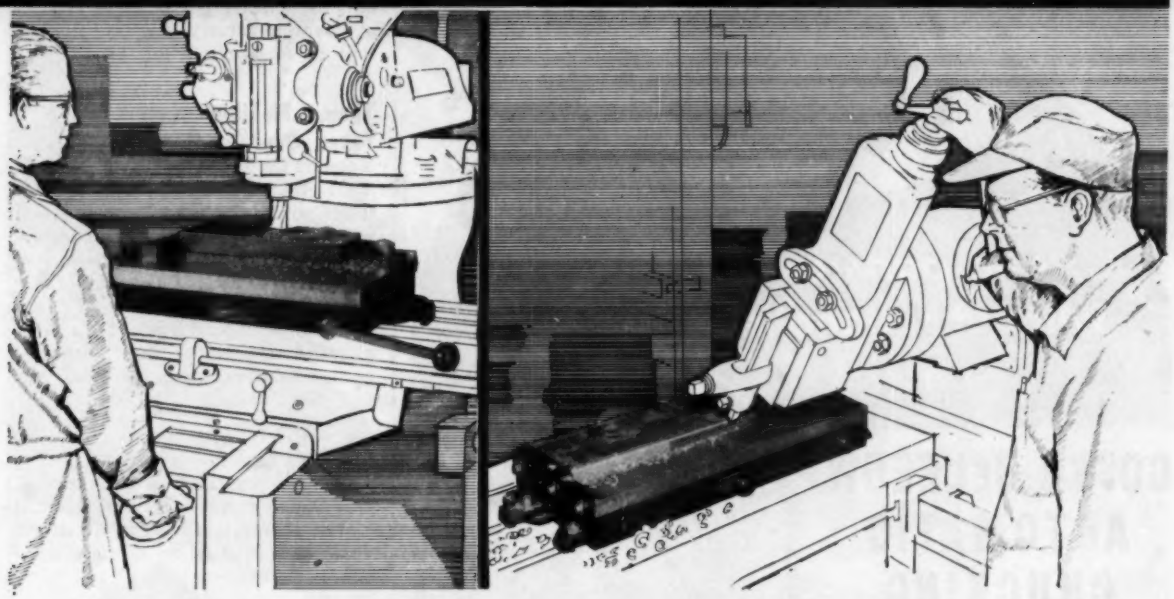
For dependable, trouble free operation specify Walker CERAMAX Chucks.

O.S. Walker Co., Inc.
ROCKDALE ST. • WORCESTER 6, MASS.
Original Designers and Builders of Magnetic Chucks

Turning a steel sleeve with a Walker Ceramax Chuck

Precision grinding on a Walker CERAMAX chuck

MAGNETIC CHUCKS



MILLING

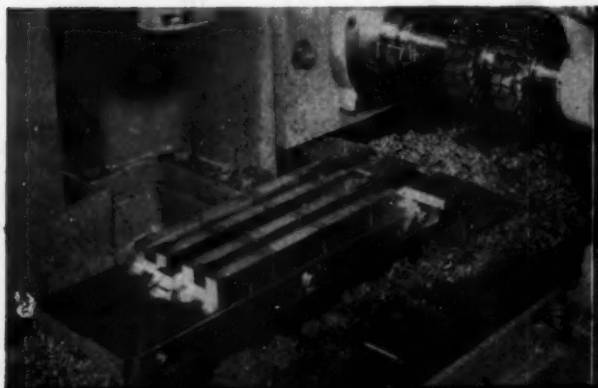
Walker CERAMAX Chucks eliminate tedious clamping in many milling operations. Only an auxiliary end stop to take the thrust on the table is needed for extra heavy cuts. Power-packed ceramic magnets individually magnetize each pole. Focused flux keeps the magnetic force down near the top plate and away from the spindle. Controlled magnetism from alternating north and south poles actually exerts a demagnetizing influence on the cutter. Tools remain chip-free.

SHAPING

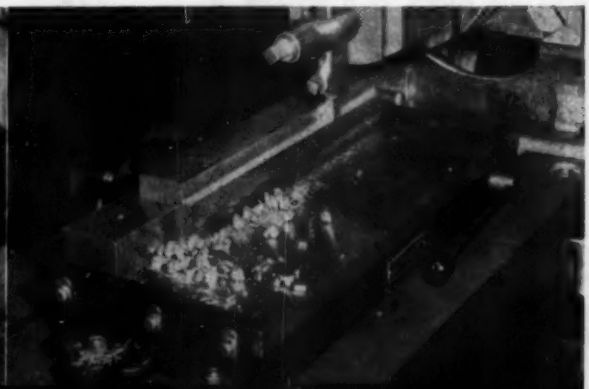
Walker CERAMAX Chucks reduce machine down time and speed production in many shaping, profiling, broaching and planing operations. Extraordinary resistance to sliding force results from coercive force exerted by the fine pole divisions of permanent ceramic magnet chucks.

Check your plant for the many cost saving applications possible with Walker CERAMAX chucks.

O.S. Walker Co., Inc.
ROCKDALE ST. • WORCESTER 6, MASS.
Original Designers and Builders of Magnetic Chucks



Walker CERAMAX chuck holds eight pieces for gang milling



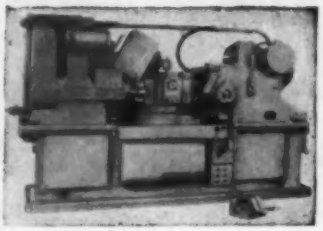
A Walker Ceramax Chuck holds steel pieces during shaping operation

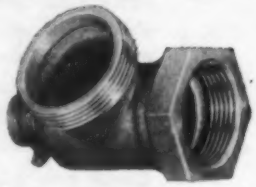
...and parts are finished without rehandling on

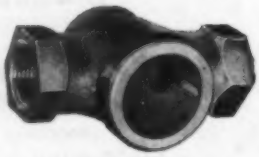
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.







A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

by mid-March and the plant will employ about 400. AM will build only its Classic Six Rambler model at Brampton this year; other models will be imported from the US.

Thomas Flexible Coupling Co Taken Over by Koppers

Koppers Co, Pittsburgh, has acquired controlling interest in Thomas Flexible Coupling, Warren, Pa, where it will continue operation as a subsidiary. Koppers is a highly diversified company; its Metal Products Division turns out a wide line of items including piston rings, Fast's self-aligning couplings, sound control equipment, gas cleaning devices, and industrial fans.

Sikorsky Order

Navy has awarded a $34.2 million contract to the Sikorsky Division of United Aircraft Corp at Stratford, Conn, for production of new anti-submarine helicopters.

Markem to Reward Owner Of Oldest Marking Machine

Markem Machine Co, Keene, NH, is offering twice the original price for the oldest Markem marking machine still in service. The winner, which must be in running order, and in at least limited service, could be as old as 50 years; Markem machines were first made in 1911. Company emphasizes that the reward is not contingent on the purchase of a new model; the winning company

"You said 'file it'—not 'remember where'."

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Should we specify ABEC-7 instead of ABEC-5? What's the recommended lubricant: oil or grease? What shaft and housing tolerances shall we use? Should extended inner ring bearings be specified for the application?

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REED specialists are also readily available to help you with any bearing problem, large or small. These men are specially trained and experienced—fully able to make tiny bearings do big, important jobs. And they're located near you, as shown in the box at right. 6017

For a copy of the REED Instrument Bearing Catalog—or help with an instrument bearing problem—call or write:

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LOS ANGELES, CALIFORNIA

Division of
SKF®
INDUSTRIES, INC.

New weapon
to fight
NATCO
NATCO

profit squeeze

Start profits on the upswing by wringing the water out of drilling, tapping, and milling costs. This new Natco Drilling-Tapping-Milling Machine—with Automatic Tool Changing and Natcotrol—is just the machine to do it.

Virtually eliminate jigs and fixtures, chop parts inventory, hold lead time to hours instead of weeks, cut your scrap rate to the vanishing point, know your costs in advance—these are the kind of savings available to you through Natcotrol—Natco's own fully electro-mechanical numerical control system.

Time wasted at the tool crib? Not any more with Natco's automatic tool changer that works without tool coding, and always holds the next tool ready for quick changing.

More reasons for putting Natcotrol and the Natco Automatic Tool Changer to work with Natco's powerful new Drilling-Tapping-Milling Machine, cutting your costs and widening your profit margin: Big work area, full numerical control of spindle depth and tool changing as well as table positioning, 50 - 3000 rpm, 2000 lb. thrust, 10 seconds tool changing time, 16" stroke, fast positioning, ±.001" accuracy.

Get us started on a quote for you today. There's a Natco representative in your territory ready to talk business. Write for bulletin No. 157-2.

NATIONAL AUTOMATIC TOOL CO., INC.
Richmond, Indiana

NATCO

Changer arm rotates to bring new tool into position. While new tool is operating, tool presenter will index to receive old tool.

and machine will be featured in the firm's publicity program. Model or serial numbers of entries should be sent to Markem Machine Co, 164 Congress St, Keene, NH, before March 20. If serial numbers can't be found, a description of the machine should be sent.

American Brake Shoe Buys Dynisco

Dynisco Inc, a Cambridge, Mass, manufacturer of electro-mechanical transducers and ultra-sensitive measuring instruments, has been purchased by Brake Shoe and will be operated as a division.

Dynisco's principal products are miniature devices which measure flow, pressure, force, acceleration, and displacement. In addition to the aerospace industry, the company's products are widely used in the fields of industrial automation and process control. Management of both companies feel that Dynisco is near a technical breakthrough in the manufacture of a solid state transducer —a device that will reduce the complexity and cost of instrumentation systems.

General Drop Forge Closing Buffalo Plant

General Drop Forge Corp, a subsidiary of Dana Corp of Toledo, will gradually close its Buffalo facility during the next few months. Work force, which has topped 400 in past years, is down to abcut 250. Reason for the closing, according to General Manager Joseph E Starich, is that "the forging business has been declining in recent years, and there is an over-supply of forging capacity in the country." Dana has two other forging plants, in Lansing, Mich, and Toledo, both now operating at partial capacity. General Drop Forge was founded in 1900.

Saginaw Steering Gear . . .

. . . a division of General Motors, has established a separate actuator operation that'll be responsible for the research, development, design, production, and application of ball bearing screws and splines made by the division.

Vinco to Make Beryllium Parts

Vinco Corp, headquartered in Richmond, Va, and a longtime producer of metal parts, gages, tools, checking and production instruments, is going into manufacture of beryllium parts at its Detroit Division. Since ultra-precision machining tolerances are a prerequisite for maximum application of beryllium's metalurgical advantages, Vinco feels that its many years of "ultra-precision experience" make it especially suited to design, develop, and make beryllium components.

Vinco optical inspection devices, and benches for measuring radial angles, are used by several processors of the metal for checking out in process inspection.

Bell & Howell Purchases Folder Machine Firm

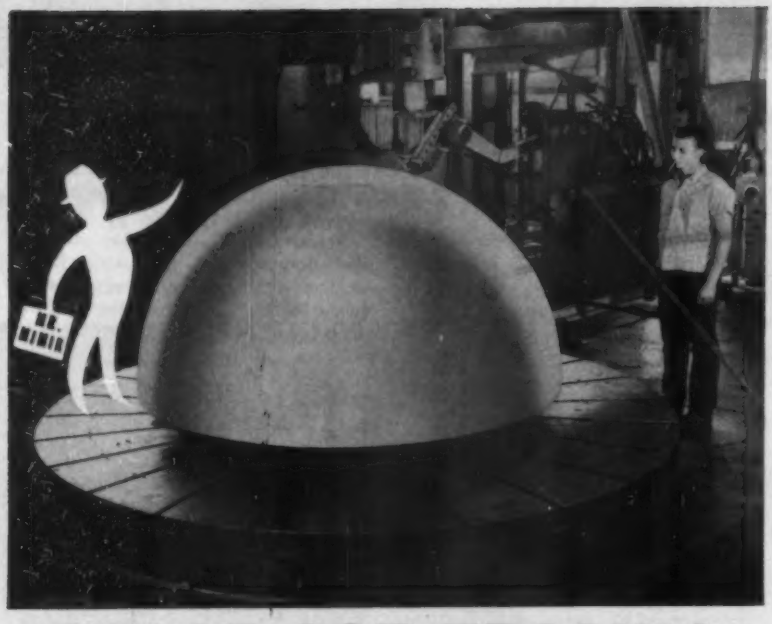
Bell & Howell Co, Chicago, has bought Russell Ernest Baum Inc, Philadelphia manufacturer of folding machines, and its subsidiary, the Liberty Folder Co of Sidney, Ohio.

The Baumfolder line of more than 100 automatic models, used by printers, publishers, bookbinders, mailing services, and educational institutions, will supplement B & R's office equipment line.

Square D to Operate in NC

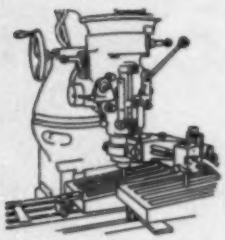
Square D Co, Chicago manufacturer of electrical control and distribution products, has purchased the 98,000 sq-ft Gorham Co plant in Asheville. No date has yet been set for opening, since plant alterations will be made. Some 200 to 300 workers will be employed when operations begin.

"That took a lot of nerve, Ed,—hesitating a moment before agreeing with J. B. . . ."



SPACE AGE TRACING WITH MIMIK®

Turret Lathe



Milling Machine

Engine Lathe

Large spherical and contoured surfaces offer no problem to the versatile Mimik Hydraulic Tracer at Kinco Inc., Montebello, California. With a Mimik high precision tracer installed on this 144-inch boring mill, contoured surfaces can be held to exacting tolerances and finishes. This Mimik Tracer can also be transferred quickly to any other mill in the Kinco plant when needed.

Contour machining of large or small components in short or long runs is ideally handled by Mimik where tracing gives big savings in set-up time, tooling and finishing. The versatile and highly interchangeable Mimik will upgrade your existing machines, improve your competitive position and give you a high degree of flexibility to meet today's rapidly changing production demands.

Enquire of Mimik's unique guarantee of time and performance related to a specific job and machine. Write today for more information on Mimik applications for engine and turret lathes, V.T.L.'s and milling machines, or ask for your local Mimik-man to call.

Ask about the new Mimik Templator, too. Working direct from drawings, tracing templates can be cut accurately and simply, in minutes, to .0002". No layout, sawing, filing or polishing required.

MIMIK® TRACERS

MIMIK TRACERS INC., Buffalo, N.Y.
EAST: Mimik Tracers Inc., 3901 Union Rd., Buffalo, N.Y.
CENTRAL: Bartsch Tool Corp., 3714 Oakton St., Skokie, Ill.
WEST COAST: Allied Pacific Manufacturing Co., Compton, Cal.
CANADA: Retor Developments Ltd., Galt, Ontario

Mimik-men are everywhere

Powder Metallurgists Set Up West Coast Section

The American Powder Metallurgy Institute, a new national organization, has established a Section in the Los Angeles area for engineers, metallurgists, and others interested in the field. Meetings will be held monthly for exchange of technical information and ideas, discussion of advances in applications, and to hear speakers commenting on various aspects of the industry. Further information can be obtained from the Institute's executive secretary, Kempton H Roll, 60 East 42nd St, New York 17, NY.

Quaker State Metals Upping Capacity

Expansion of operations to increase aluminum sheet and coil production capacity by 150% (up to 150 million pounds per year) is in the works at Quaker State Metals Co, Lancaster, Pa, division of Howe Sound Co. Immediate plans call for a total additional manufacturing area of approximately 30,000 sq ft; 20,000 sq ft have just been completed to house new fabricating equipment for mill products. Orders have been placed for a new four-high, single stand Bliss cold finishing mill for finish rolling of aluminum down to 0.004-in. thickness in widths up to 48 in.

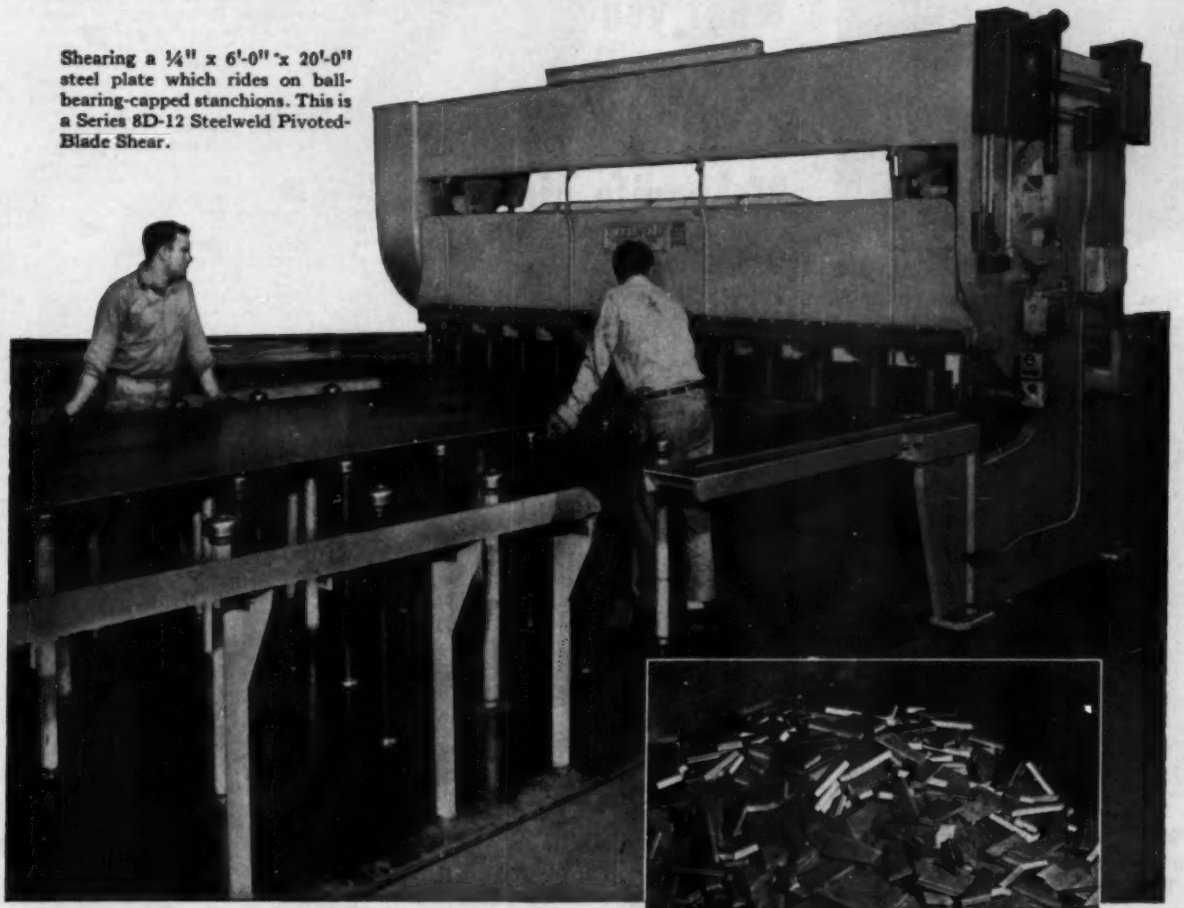
SMS Corp Merges With Mallory

The SMS Corp of Birmingham, Mich, manufacturer of resistance welding materials, has merged with P R Mallory & Co, Indianapolis. The company which has been a wholly owned subsidiary of Mallory for ten years will continue to operate as the Birmingham plant of the Mallory Metallurgical Co, a Division of P R Mallory. •

"The door to my office is always open, Smith. . . . go out through it!"

STEELWELD SHEAR
Serves TOUGH JOBS Well

Shearing a ¼" x 6'-0" x 20'-0" steel plate which rides on ball-bearing-capped stanchions. This is a Series 8D-12 Steelweld Pivoted-Blade Shear.



A part of an order of 120,000 gussets cut on the shear.

FOR several years a Steelweld Shear has been in operation at the Drake Steel Supply Co., Los Angeles, California. Most of the time it has been worked on a 16-hour-a-day schedule. It is used for a wide variety of shearing, mostly on 3/16-inch and ½-inch steel plate.

The machine has proven itself on all sorts of shearing jobs. A particularly tough one was the cutting of 120,000 small odd-shaped gusset plates. These were of three sizes and cut three to six at a time of ½-inch steel. The work jarred the shear terrifically, but because of its heavy construction, did not affect it in any way.

Considering the volume of work and hard service, the knives hold up very well. They need be turned only about once every six months.

Write for free copy of catalog No. 2011

STEELWELD

PIVOTED BLADE **SHEARS**

Steelweld Machinery Includes: Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

1458 East 282nd St., Wickliffe, Ohio

MEEHANITE® MEANS BETTER CASTINGS

By W. H. MOORE
Vice President
Meehanite Metal Corp.

What you should know about Meehanite Metal

WHY THERE IS NO EQUIVALENT

How many times have you been told "I can give you something just as good as Meehanite® and at a lower price" only to find that the castings did not meet your standard of quality.

Actually there is no equivalent for Meehanite metal. Here's why: The exclusive Meehanite process makes use of 32 patented procedures that are essential to the production of highest quality castings and which can be used only by bonafide Meehanite licensees. These procedures relate to all phases of manufacture including processing agents, melting furnaces, sand control, and molding to insure the integrity exhibited by every Meehanite casting. More than 200 Meehanite foundries throughout the world prove the validity of these techniques and share in 35 years of technological know-how that truly puts Meehanite metal in a class by itself.

The production of Meehanite® involves a lengthy training period under the direction of Meehanite engineers, and a continuing program of metallurgical help and advice. Set standards of operation enable Meehanite foundry-men to apply structural control to castings on a day by day basis.

Essentially, the metallurgical control in the production of Meehanite castings involves obtaining a balance between undercooling produced in the melting operation and nucleation produced by processing the molten metal with alkaline earth agents. The initial degree of undercooling is related to the mass of the casting to be poured and the density and physical properties required. This is then modified by nucleation to force deposition of graphite at exactly the right time during solidification so as to give the right size and shape and distribution to the free graphite at the same time maintaining the character of the metallic matrix. The net result is predictable properties and uniform structure in every section of a casting and from casting to casting.

Gray cast iron made to a chemical specification without benefit of controlled undercooling is influenced by mass effect to a maximum degree and for this and other reasons cannot be considered an equivalent to Meehanite.

There are more than 26 different types of Meehanite metal available, each of which is specifically designed for a given set of service and conditions.

Accept no substitute for Meehanite quality and performance. Specify Meehanite castings and be sure. For more information about Meehanite castings and the foundries making them, write to: *Meehanite Metal Corporation, 714 North Avenue, New Rochelle, New York.*

MEEHANITE METAL

Meehanite Castings Are Made Only By Meehanite Foundries

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 MACHINING ALUMINUM — *Kaiser Aluminum & Chemical Sales Inc, 300 Lakeside Drive, Oakland 12, Calif.* 104-page booklet, "Machining Kaiser Aluminum with Automatic Screw Machines," presents technical data and tooling information applicable to the production of automatic screw machine parts made of aluminum. New machining ideas and tooling concepts have been correlated and added to the original text which was published in 1955 and reprinted in 1956. Additions and changes have been made to conform to current field practices, with emphasis placed on design advancements made in automatic screw machines operating at higher feeds and speeds. An extensive chart indicating possible troubles encountered and practical remedies for overcoming them is included.

2 MULTIPLE WHEEL GRINDER— *Landis Tool Co, Waynesboro, Pa.* 16-page catalog IWR-60 illustrates and describes the 10-in. and 14-in. Type IWR semi-automatic wheel grinders. Principal advantage is ability to simultaneously grind multiple line diameters in one operation.

3 TAPE-CONTROLLED MACHINE — *Burg Tool Manufacturing Co, 15001 S Figueroa St, Gardena, Calif.* Bulletin pictures and gives complete specifications of Burgmaster Model 3BHT-B tape controlled 8-spindle turret drilling, tapping, and boring machine. Unit is capable of fully automatic machining of large workpieces on a table having 62 x 50-in. machined surface. Infinitely variable pre-selective feeds are provided and 24 speeds range from 70 to 2400 rpm. 3-axis automatic depth control by tape is also now available with any of nine different makes of tape control systems.

4 DRILLING MACHINES AND SURFACE GRINDERS—*Foote-Burt Co, Cleveland, Ohio.* 6-page condensed catalog illustrates and describes the Sipp and Hammond lines. Covers features of the Footburt-Hammond radial drilling machine, the Footburt-Hammond surface grinding machine, and the Footburt-Sipp sensitive drills.

5 SWISS AUTOMATICS — *American Bechler Corp, 23 Harbor St, Stamford, Conn.* 4-page illustrated bulletin AR-60 describes and gives specifications for Bechler Model AR Swiss automatic bar machines and accessories. Operational principles are explained with each part described in detail as to function and features. Especially stressed are the three spindle universal attachment and the six spindle hydraulic drum turret for performing end operations such as centering, drilling, reaming, threading, tapping, and similar jobs.

6 MARK CENTURY NUMERICAL CONTROL — *General Electric Co, Schenectady 5, NY.* 4-page bulletin GEA-7209 covers new transistorized machine tool control capable of performing positioning and/or contouring from standard punched-tape program. Describes both point-to-point positioning and continuous-path control functions of the new equipment; summarizes computerless contouring, use of solid-state plug-in printed-circuit modules in high-speed logic circuitry, control power requirements, and physical dimensions.

TOOLS AND ACCESSORIES

7 BORING BARS, TOOLS, AND ACCESSORIES—*Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.* 24-page catalog D-520-A explains the Davis Boring Bar Tooling System and lists the complete line of bars and related tools and accessories. Covers general purpose and production bars for line and stub boring;

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It doesn't matter whether your product is large or small . . . travelling 300 miles or 3000. The moment you call AIR EXPRESS (and one call is all it takes), the nation's largest air-ground shipping service is on your team. That means your shipment gets top priority on all 35 scheduled U. S. airlines—first on, first off. It's picked up and delivered—door-to-door—by a special fleet of 13,000 AIR EXPRESS trucks, many radio-dispatched. And it always gets the kid-glove handling it deserves, to 23,000 communities in all 50 states. These are just some of the reasons why, more than ever, it pays to think fast, think AIR EXPRESS first.

AIR EXPRESS

CALL AIR EXPRESS DIVISION OF R·E·A EXPRESS • GETS THERE FIRST VIA U. S. SCHEDULED AIRLINES

CIRCLE 258 READER SERVICE CARD

AUTOMATIC FLASH REMOVAL SETUP for die-cast zinc carburetor parts. Two brushing heads—each made up of seven Osborn Master® Wheel brushes—are mounted over the conveyor. Parts (shown fixtured in lower left corner) pass under brushing heads where all flash is removed as they travel to next work station.

OUTPUT TRIPLED from 200 to 600 an hour with OSBORN power brushing

Before: this auto equipment maker was using costly off-hand methods to remove flash from these die-cast zinc carburetor parts. Production was slow . . . it varied from shift to shift, averaging about 200 pieces per hour.

Now: parts are Osborn power brushed clean as they travel between work stations by conveyor . . . *eliminating manual handling.* The setup of Osborn Master® Wheel brushes does the job at rates up to 600 pieces per hour . . . *three times as fast.* The operation is simple, inexpensive. Results are uniform, with excellent quality control.

This application is typical of how *your* tough metal finishing problems of every description—deburring, cleaning, polishing, precision blending—can be solved with today's Osborn power brushes and brushing methods. An **O**sborn **B**rushing **A**nalysis—made at no obligation in your plant now—is the first step. Write or call *The Osborn Manufacturing Company, Dept. C-107 Cleveland 14, Ohio. Phone ENdicott 1-1900.*

Osborn Brushes

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

bar slots for Davis blocks, straight-through, or angular flycutter tooling, Super-Mike flycutter tooling, and keyways.

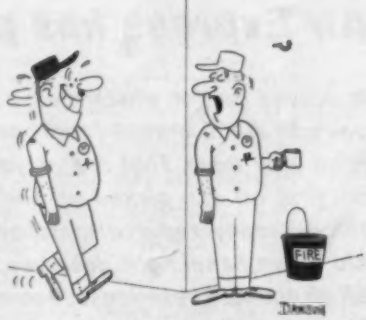
8 POWER TOOLS—*Rockwell Manufacturing Co, Delta Power Tool Division, 400 N Lexington Ave, Pittsburgh 8, Pa.* Revised 92-page catalog describes complete line of industrial power tools and accessories. Includes drillpresses, grinders, shapers, planers, jointers, metal and wood cutting lathes, tilting arbor saws, unisaws, bandsaws, and radial saws. Complete specifications, catalog listings, and descriptions of accessories are provided.

9 CIRCULAR FORM TOOLS AND BLANKS—*Somma Tool Co, 109 Scott Rd, Waterbury, Conn.* 19-page catalog 61 covers complete line for use in automatic screw machines. Range of cutoff and form tool blanks made of T-15 Vasco Supreme HSS is featured. This material was specially developed to provide extremely high wear resistance in cutting abrasive materials such as aluminum, copper, stainless, beryllium copper. Also listed are the new Somma grinding arbors for all sizes of B&S and Davenport tools.

10 GAGES AND COMPONENTS—*Federal Products Corp, 1144 Eddy St, Providence 1, RI.* 36-page catalog 60 AM provides information on line of automatic gages and gaging components featuring transistor operated gaging and control equipment. Complete machine control gages and automatic sorting gages are detailed in the first two sections of the catalog; third section deals with gaging components which serve as building blocks for those who wish to incorporate them into machine tools or gages of their own design. Mounting dimensions and specifications are given in a 4-page supplement.

11 PRESS BRAKE DIES — *Valeron Corp, Press Brake Division, 58 Factory Rd, Addison, Ill.* 28-page catalog contains over 360 drawings of standard and special press brake dies. In addition to listing the single and multiple bend forming, blanking, notching, and punching dies manufactured by the firm, the catalog contains tonnage requirement tables for both punching and bending various thicknesses of mild sheet steel.

12 METALWORKING TOOLS — *Plow Tool Corp, South Line St, Columbia City, Ind.* 24-page illustrated catalog covers line of cold-heading, forming and cutting tools. Includes wide range of special tools —hollow mills, seating and trepanning tools, reamers, and others made to individual customer specifications. •



"Pssst, ... Care for a little fire-water?

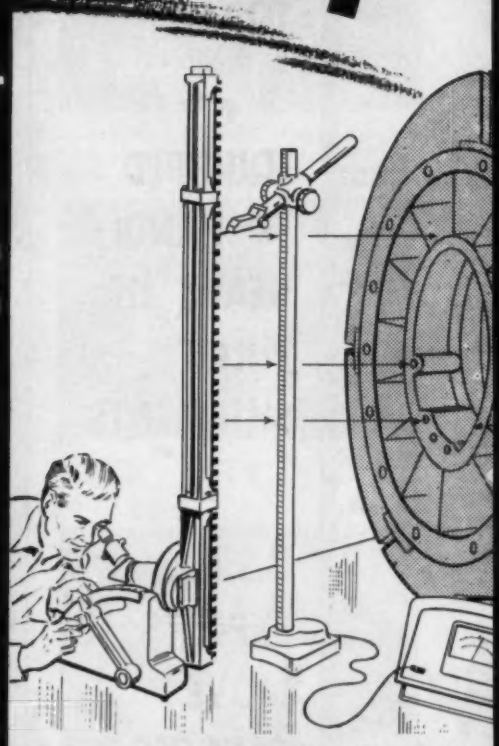
25-37-49-61 INCHES

The NEW Webber OPTICAL HEIGHT GAGE

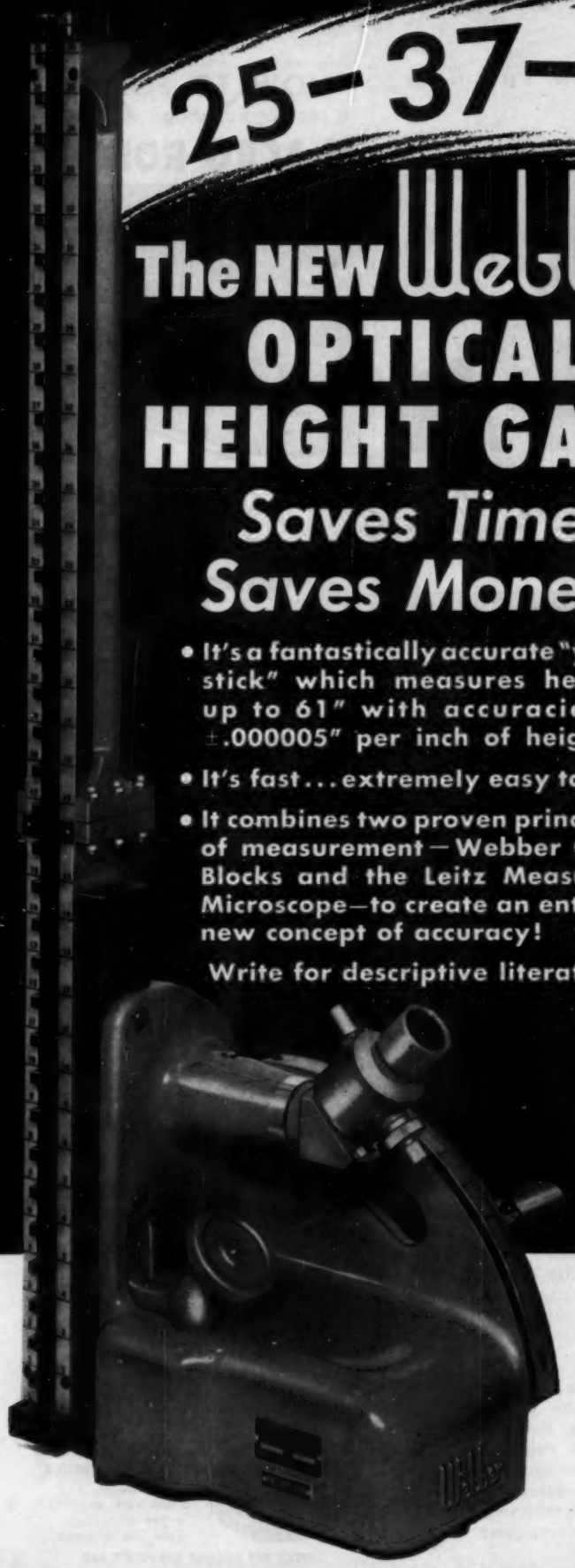
Saves Time! Saves Money!

- It's a fantastically accurate "yardstick" which measures heights up to 61" with accuracies of ±.000005" per inch of height.
- It's fast... extremely easy to use.
- It combines two proven principles of measurement—Webber Gage Blocks and the Leitz Measuring Microscope—to create an entirely new concept of accuracy!

Write for descriptive literature.



All adjustments and readings are made at bench level



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CIRCLE 261 READER SERVICE CARD

NAMES IN THE NEWS

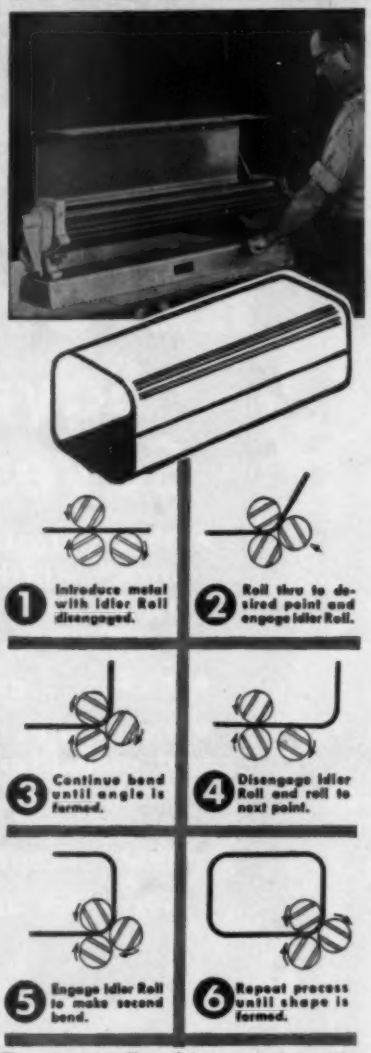
Foote-Burt Co, Cleveland, has appointed **F T Harrington** vice president, marketing. Mr Harrington has been vice president of Vickers Inc Division of Sperry-Rand Corp for the past 20 years

Clearing Division of US Industries has named **Frank Iaconetti** general manager of the Hamilton, Ohio, plant which recently became headquarters for the Clearing-Axelson lathe line.

Ford Motor Co has appointed **Will Scott** executive director of the central product planning office and vice chairman of the product planning committee. **Dr Donald N Frey** replaces Mr Scott as product planning manager of the Ford Division. He was formerly assistant chief engineer of the Ford and Mercury product engineering office. **D J Bastian**, manager of Ford's Los Angeles assembly plant, has been named plant operations manager in charge of the recently established Automotive Assembly Division.

Harold E Pape, vice president and assistant to the president of the **Stanley Works**, New Britain, Conn, has retired. Mr Pape was elected to his present position in 1959 and had served as executive vice president since 1957. He will continue as a director of the company.

HOW TO FORM
a rectangular shape with the
DI-ACRO ROLLER


1 Introduce metal with idler Roll disengaged.
2 Roll thru to desired point and engage idler Roll.
3 Continue bend until angle is formed.
4 Disengage idler Roll and roll to next point.
5 Engage idler Roll to make second bend.
6 Repeat process until shape is formed.

Forming small and large circles without flat spots and a variety of other sheet metal shapes is easily accomplished on the Di-Acro Roller with its *exclusive cam actuated Idler Roll*. Rear roll indicators allow operator to quickly return to a previous setting. Eight models from 6" to 42" forming width.

NEW DI-ACRO POWER ROLLERS

Increase speed and efficiency. Forward, stop and reverse are governed by foot control leaving both hands free for feeding materials. Six sizes from 12" to 42" wide all with 2" ground and polished forming rolls.

For six page roller folder call your nearest Di-Acro dealer listed in the yellow pages under Machinery—Machine Tools or write to us.

pronounced *die-ack-ro*

di-acro PRECISION METALWORKING MACHINES

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formerly
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Lake City, Minnesota

CIRCLE 262 READER SERVICE CARD

FIELD PROVEN...

Honeywell Electro Hydraulic Tracer Systems

Now operating on a wide variety of well-known machine tools (some of them illustrated at the right), Honeywell 180° and 360° Tracer Control systems provide fast, accurate and reliable system response for smooth application of large increments of hydraulic power.

They combine the flexibility, remote control and finesse of electronics with the power and fast actuation of hydraulics. They're far more flexible than completely hydraulic systems. These systems have been designed for ease of application. Modular construction simplifies and speeds field service.

Accuracy—Accuracies of ± .0005" from template to part and ± .0002 from part to part have been achieved in actual use.

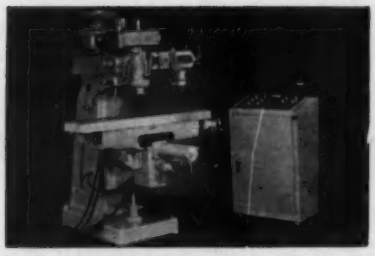
Adaptability—These systems are now in operation on all types of machine tools, from light duty engine lathes to huge spin forging machines. Every application is custom fitted—at production line prices.

Performance—Each Honeywell system becomes an integral part of the machine tool. The control system can be adjusted to compensate for changes in machine performance during the life of the machine. Speed range of 300 to 1 is normal; greater rangeability is available on some applications. Tracing speed ranges up to 60" per minute are available.

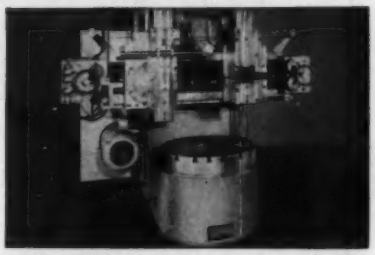
For further information on Honeywell's new machine control systems and components and their application to your specific job, contact Minneapolis-Honeywell, Machine Control Group, Dept. AM-2-93, Minneapolis 8, Minnesota.

Honeywell

First in Control



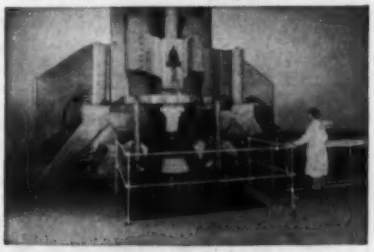
Gorton Vertical Milling Machine equipped with Honeywell 360° Electro Hydraulic Tracer Control System.



Giddings & Lewis vertical turret lathe with Honeywell 360° Electro Hydraulic Tracer Control System.

Frauenthal Division of Kaydon Engineering Corporation turning and grinding machine with Honeywell 180° Electro Hydraulic Tracer Control System.

Rockford Machine Tool Company hydraulic mill with Honeywell 180° Electro Hydraulic Tracer Control System. Swarfing operation.



Hufford Corporation spin forge machine with *two* Honeywell 360° Tracer Control Systems plus spindle speed control.

CIRCLE 263 READER SERVICE CARD

ONLY ONE AX TO GRIND

CARBIDE DIES EXCLUSIVELY—Yes, Oberg has "only one ax to grind"— complete carbide die service for production applications that are physically and mechanically adaptable. Extensive experience and pride of craftmanship are behind every carbide die made by Oberg . . . and thousands have been manufactured for industry everywhere. As specialists in the field of carbide dies with no other "ax to grind" the engineering, production and service facilities of Oberg are geared to meet requirements for design, accuracy, delivery and performance that only carbide dies can give! Inquiries? We thrive on them! Send yours in today for prompt attention!

Oberg is something special

Oberg Manufacturing Co., INC.
FREEPORT, PA.

Send today for brochure describing Oberg carbide die services and facilities.

CIRCLE 264 READER SERVICE CARD

TRIAL SAMPLE!

SPECIAL LUBRICANT EASES WORKING STAINLESS AND TOUGH METALS

New lubricant eases stamping and machining operations on the toughest metalworking jobs—takes the problems out of hard-to-work metals such as stainless, high carbon, high chrome, cast iron, monel, etc. Scientifically developed ANCHORLUBE now used extensively in a wide range of applications—drilling, tapping, spot facing, counter-boring, milling, fly-cutting, seat forming, engraving, broaching, drawing, piercing, punching, hole extruding, etc. Application by swab, spray, roller or brush. Send today for free trial sample and see for yourself how easy you can work the job with ANCHORLUBE.

ANCHOR CHEMICAL COMPANY
Dept. AM-10 10721 Briggs Road • Cleveland 11, Ohio

NAMES IN THE NEWS

Landis Machine Co, Waynesboro, Pa, has named **A R Margin** export sales manager to succeed **J M McNeal** who has retired

Dr Andrew A Kucher, vice president, engineering and research, **Ford Motor Co,** has been named president of the **Society of Automotive Engineers** for the 1961 term

Huck Manufacturing Co, Detroit, has appointed **Joseph E Callahan** vice president, sales. Mr Callahan comes to Huck from Cleveland Pneumatic Tool Co where he was commercial vice president in charge of sales.

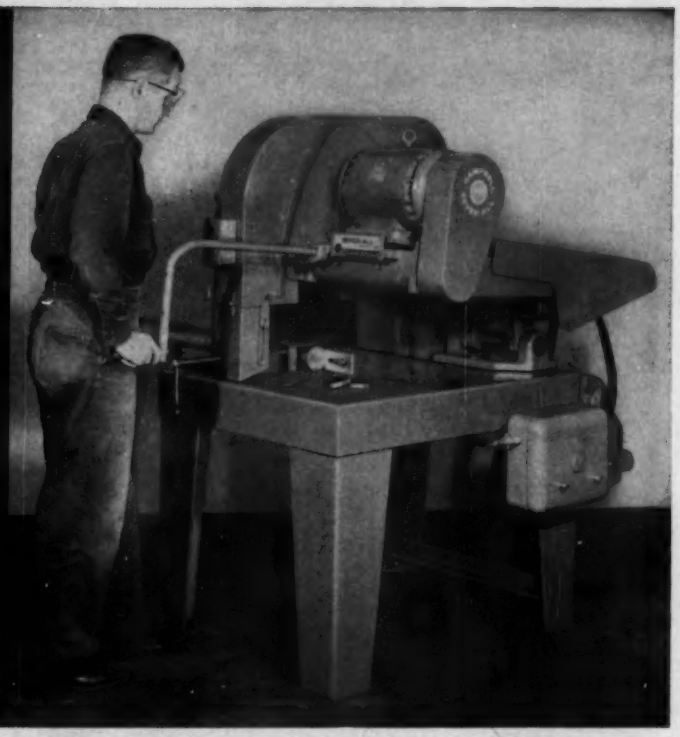
SKF Industries, Inc, Philadelphia, has appointed **James R Miller** production manager to succeed **J A Graham** who has joined Bearings Co of America. Mr Miller joined the firm in 1957 as manager of production and inventory control.

Kropp Forge Co, Chicago, has named **John H Nelson** executive vice president. He was previously vice president, sales.

A E Parker & Sons, Howell, Mich, machine tool builder, and tool and die designer, has appointed **Edward Farwig** chief engineer and **Verne Doneth** plant superintendent.

NEW!

GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4″ round or square solids, 6″ diameter tubing or standard pipe, 6″ x 1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

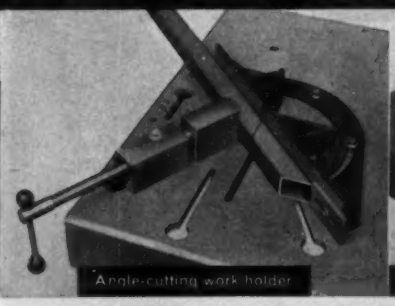
Safe • wheel guard provides complete operator protection.

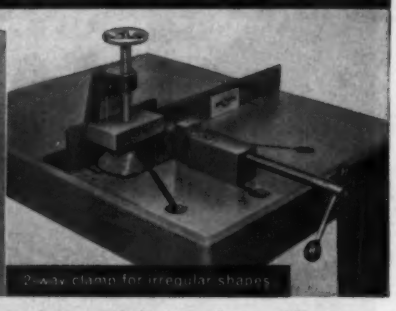
Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp


Angle-cutting work holder


2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

ACCO

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

923 Connecticut Avenue, Bridgeport 2, Conn.

NEW . . . ALL NEW . . . FROM

KALAMAZOO

The "BIG K"

Now, after more than four years' research, Kalamazoo brings to you the all new Model 14A — horizontal metal cutting bandsaw. Incorporating some 30 shop proven, cost saving features, this hydraulic driven, heavy duty bandsaw offers cutting capacity and ability in excess of *any* cut-off method, at far less tool cost per square inch of cutting.

Most important among these profit producing features are: positive control force feed; clockwise blade rotation to reduce teeth shock — increase blade life; convenient 36" machine height to reduce operator fatigue; large 14" x 24" capacity; push button control; dual movable vise jaws; adjustable blade tension.

For complete details on this amazing new machine tool, phone, write or wire your Kalamazoo representative. Facilities for test runs of your material on the "Big K" are at your disposal — at no obligation.

MACHINE TOOL DIVISION
Kalamazoo Tank & Silo Company

508 Harrison St.
Kalamazoo, Mich.

NAMES IN THE NEWS

Ex-Cell-O Corp, Detroit, has promoted **Roland T Volker** to assistant sales manager, Precision Parts Division. He has been working in the company's aircraft parts sales since 1951

Allen Manufacturing Co, Hartford, Conn, maker of hex socket screws, has appointed **Edmund West** works manager. Prior to joining the company, Mr West was manager of the Marysville, Mich, plant of Allied Products Corp.

Chrysler Corp has appointed **James F Mitchell** general plants manager for the Service Parts and Accessories Division (MoPar). He has been operating manager for the MoPar Division since June 1957.

Diehl Manufacturing Co, Somerville NJ, has appointed **Elwood Roger Zeek** vice president in charge of research and engineering. **George J Abel** has been named vice president, manufacturing engineering.

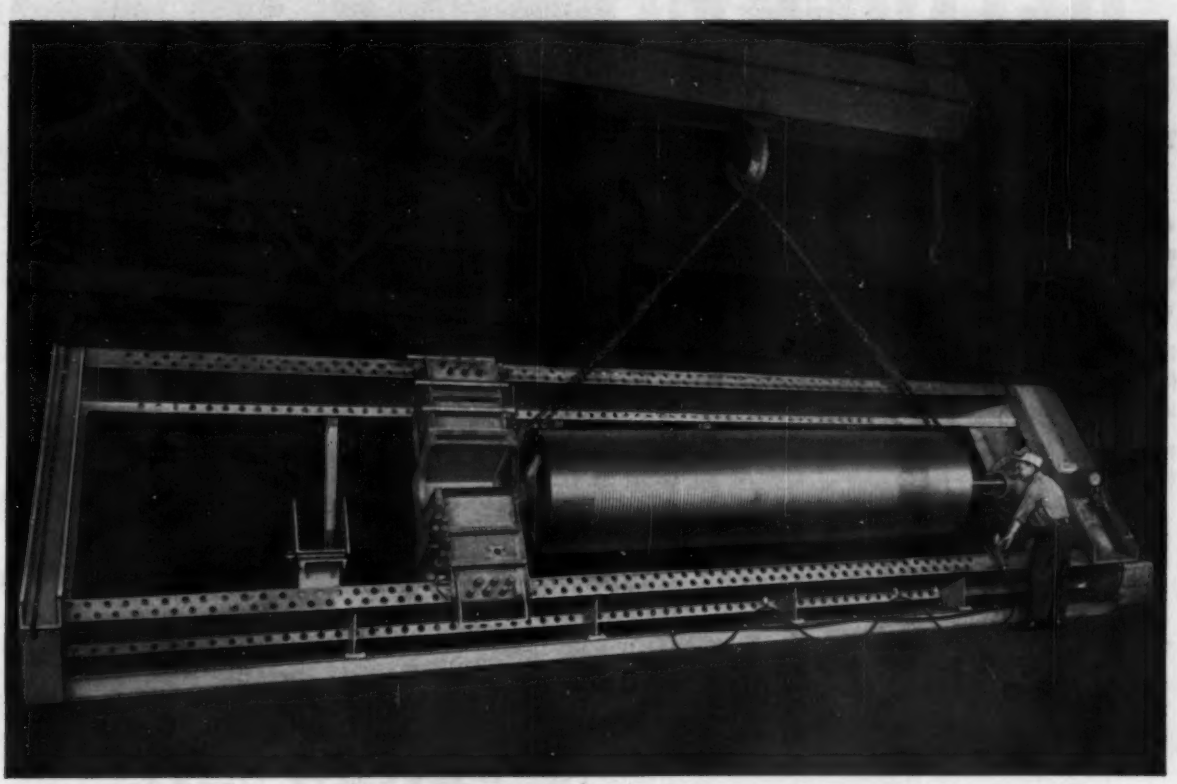
Beryllium Corp, Reading, Pa, has appointed **Charles A Evans** general sales manager. He has been associated with Aluminum Co of America for the past 25 years.

Porter-Cable Machine Co, Syracuse, NY, has named **Francis H Gerlach** vice president, engineering. He was formerly president and general manager of Han-Kor Co of Cleveland.

Food Machinery & Chemical Corp, San Jose, Calif, has elected **Hubert L Byrd** executive vice president in charge of machinery divisions. He was previously vice president and coordinator of FMC's agricultural equipment operations.

Parker Seal Co, Culver City, Calif, division of Parker-Hannifin Corp, has appointed **George Meyer** vice president, manufacturing. He was formerly manager, manufacturing. •

When jobs are too big or heavy for a conventional press...



THE DAKE HORIZONTAL INCLINED PRESS is recommended for work on jobs that are so big or heavy that it is more convenient to do press work while the piece remains suspended from an overhead crane or hoist.

For instance in the illustration above, a 7-inch shaft is being pressed into the cable drum for a 200-ton overhead traveling crane. The drum is 17 feet long and 4 feet in diameter, and is supported on a crane hook.

This particular press (Model 32-100) is 33 feet long over-all and has a daylight opening of 25 feet. It has 300 tons capacity, a 60° inclined frame, 26-inch stroke, and a ram-to-table distance from 25 inches to 25 feet. The table is moved along the frame with a hand winch.

Dake Hydraulic Presses are engineered to meet such a variety of shop requirements that the engineering is probably almost done on the press you need. Let us quote.

DAKE CORPORATION, 636 Robbins Road, Grand Haven, Michigan

DAKE PRESSES

Now—EASTERN'S Flying Freighters offer

OVERNIGHT DELIVERY

New York—Miami—San Juan
New York—Atlanta—New Orleans—Mobile—Houston
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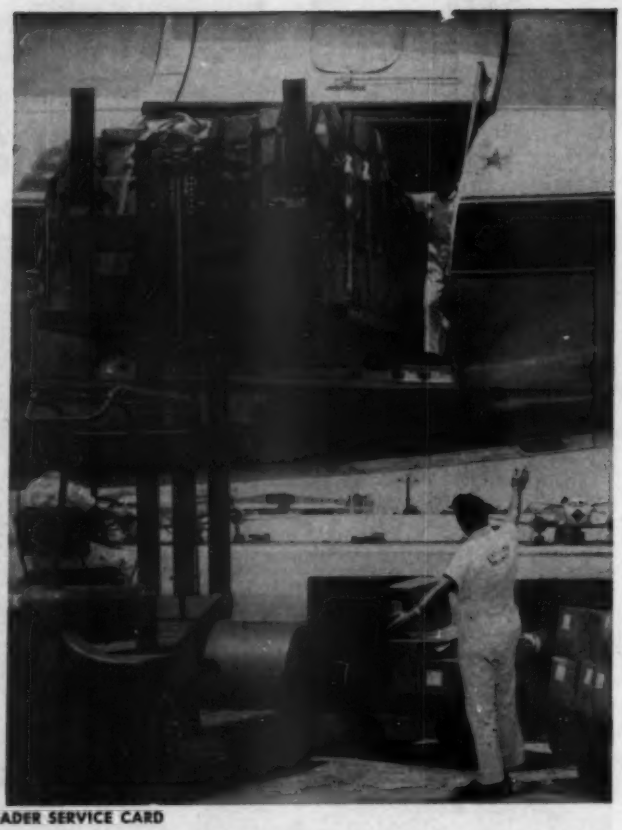
- Reserved space on every Freighter flight.
- Pressurized and temperature-controlled.
- Flights daily except Saturday and Sunday nights.
- Pickup and delivery service available.

In addition, Eastern offers freight space on over 400 daily passenger flights—including DC 8-B Jets and Prop-Jet Electras—to 128 cities in the United States, Canada, Bermuda, Puerto Rico and Mexico.

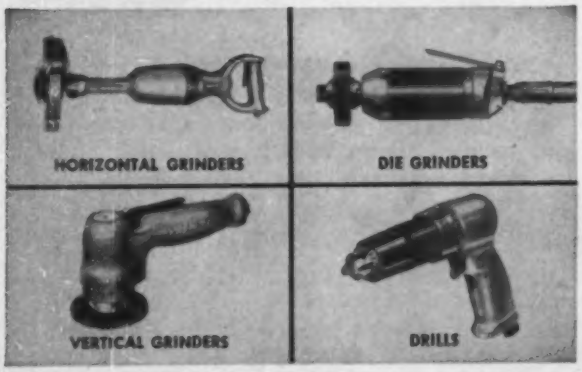
For Information and Freight Reservations, call your Freight Forwarder, Cargo Agent or Eastern Air Lines.

EASTERN AIR LINES



CIRCLE 269 READER SERVICE CARD

WILSON PORTABLE PNEUMATIC TOOLS



Lightweight • Powerful • Compact

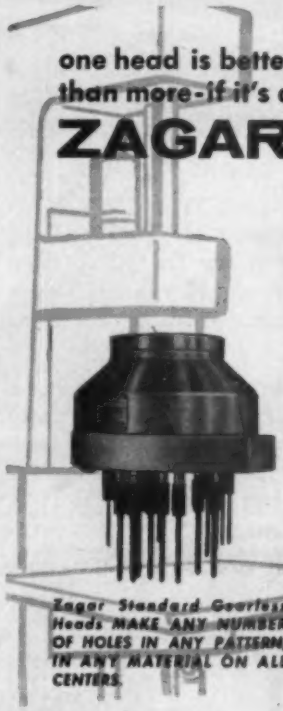
All Wilson portable pneumatic production tools are designed for easy handling. These lightweight, compact tools are production time savers on a wide range of work. Catalog PT-58 gives all the facts. Write for your copy.

TW808

THOMAS C. WILSON, INC.
21-11 44th Avenue, Long Island City 1, New York
BETTER TOOLS FOR BETTER WORK

one head is better than more-if it's a

ZAGAR Head for Drilling, Reaming and Tapping



1 to 1000 holes in one pass—as close as twice drill diameter. Costs decrease as spindles are added. *And,* a variety of hole patterns (or parts) can be produced with *one fixed center head.* Zagar units are adaptable to standard drill presses or are built as a complete installation. Send in your hole problem to Zagar.

Zagar Standard Gearless Heads MAKE ANY NUMBER OF HOLES IN ANY PATTERN, IN ANY MATERIAL ON ALL CENTERS.

Write for Manual "A-1" for engineering data.

23886 Lakeland Blvd.
Cleveland 23, Ohio

Zagar INCORPORATED

USE MORE SPINDLES TO DO MORE WORK

CIRCLE 270 READER SERVICE CARD

CIRCLE 271 READER SERVICE CARD

Announcing New

LOW INVESTMENT COMPACT BENDING MACHINES

MODEL C-4

PRODUCE QUALITY, LOW COST BENDS ON LIMITED PRODUCTION JOBS

The new Pines COMPACT Bending Machines are especially designed for low production jobs, one-of-a-kind or experimental parts, maintenance or similar work where the high output of other Pines machines is not necessary. Representing a low initial investment, COMPACT machines are easily and inexpensively tooled to bend structural shapes, solid stock, and rolled or extruded sections as well as pipe and tubing.

Light in weight for practical portability and simplified in design for maximum ease of operation and set up, this complete line of machines incorporates rugged construction and hydraulic operation to assure good quality bends with close tolerances at low cost. Find out how COMPACT Machines offer a practical answer to quality limited production bending.

MODEL C-4
Capacity up to 4" I.P.S. standard pipe... Floor space 3'x11'... weight 6300 lbs.

MODEL C-2
Capacity to 2" I.P.S. standard pipe... Floor space 2'x7'... weight 2400 lbs.

MODEL 1400
Capacity to ½" I.P.S. standard pipe... Floor space 4'x8'... weight 1400 lbs.

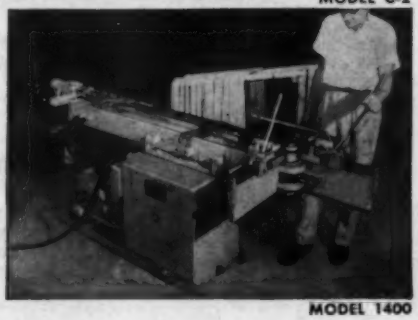
WRITE TODAY FOR COMPLETE INFORMATION

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

675 WALNUT • AURORA, ILLINOIS

MODEL C-2



MODEL 1400

CIRCLE 272 READER SERVICE CARD

Steel Drum Gears-

for HOISTING ENGINES

Your gear requirements may never call for hoisting engine steel drum gears to pull freight cars—for which purpose Stahl manufactured the gears illustrated. However, for any gear problems, in any size or quantity, it will more than pay to get that next estimate from Stahl.

SPURS TO 72" PD. 1 DP
BEVELS TO 54" PD. 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD. 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD. 2 DP
SPROCKETS TO 72" PD. 2½" CP
RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS: RAWHIDE, BAKELITE, FIBROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio

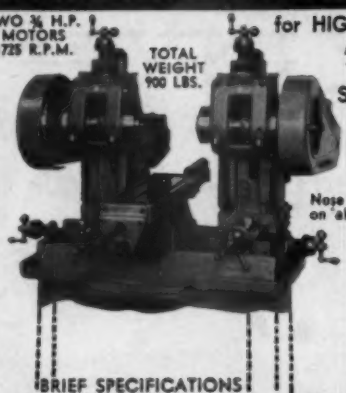
CIRCLE 273 READER SERVICE CARD

BARKER DUAL-HEAD MILLING MACHINE

for HIGH PRODUCTION MACHINING OF TWO SURFACES SIMULTANEOUSLY

TWO ¾ H.P. MOTORS 1725 R.P.M.

TOTAL WEIGHT 900 LBS.



MODEL AMD Complete with Pedestal and Two ¾ H.P. Motors. #30 Taper In Spindle Nose • Micro Feed Screws on all motions (Extra).

Stepped pulleys permit a variation of speeds on the two spindles to accomodate the proper cutter for the milling operation desired. Designed to utilize advantages of carbide tools.

BRIEF SPECIFICATIONS

• SPINDLE SPEEDS—Standard with 1725 R.P.M. Motor 493-707-966. Low Speed Drive 140-202-276. *Special Motors double these speeds or reduce them by 33⅓. *Optional at extra cost. • DISTANCE BETWEEN SPINDLE FACES—2¾" Min.—11" Max. • TOP OF TABLE TO CENTER OF SPINDLE —6½". 3" riser block increases this to 9½" at extra cost. • HEAD—Heavy rigid construction. Travel 6". • TABLE—6"x 20" working surface—½" T slot—10" longitudinal travel. Dovetail slides and adjustable gib. Can be screw feed or air—Hydraulic Operated. • SPINDLE—Nickel Steel—Hardened and Ground on Timken Bearings. • SADDLE—Semi-Steel—can be positioned at three different places to suit milling requirements.

WRITE FOR COMPLETE DATA ON THIS MILL AND OUR SMALLER P.M.D. MODEL DUAL MILL.

BARKER ENGINEERING CO.
DIVISION
THE F. HOHLFELDER CO.
26470 Lakeland Blvd. • Cleveland 32, Ohio

CIRCLE 275 READER SERVICE CARD

GOOD ON YOUR LATHES...

VERY GOOD FOR YOUR TURNING COSTS

Multi-Duty models for light work and general use. Rigid, accurate. Interchangeable male, female and pipe points.

ACCURATE

IDEAL LIVE CENTERS

4 complete lines. Over 40 sizes and styles.
All popular tapers for heaviest to lightest work.

If you turn metal, it's just good operating sense to save money with Ideal Live Centers. You'll get accuracy to meet your stated standards, at your turning level and at lowest center point costs. You'll reduce your inventory costs with fast delivery from Ideal distributor stocks. State your requirements, as tight as you like. He'll meet them exactly with the Multi-Duty, Universal, Heavy-Duty or Pipe Point model right for your job. For custom quality at production prices, call on him for all your live center needs.

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In Canada: IRVING SMITH, Ltd., Montreal

IDEAL INDUSTRIES, Inc.
2057-B Park Avenue
Sycamore, Illinois

EXPLOSIVE FORMING

Here is a detailed report on the theory and practice of explosive metal forming, a new and not-yet-exact science that forms metal to die shape by explosive impact.

Techniques (free forming, bulkhead forming and cylinder forming) are detailed in four articles from four major sources; one on general theory, one on aircraft applications, one on tubes and one on cups . . .

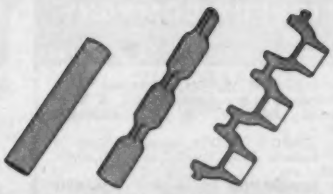
Fully illustrated, 12 pages — 30¢ each

READER SERVICE DEPARTMENT

American Machinist / Metalworking Manufacturing

330 West 42nd Street, New York 36, N. Y.

REDUCEROLL + MAXIPRES = Modern Forging!

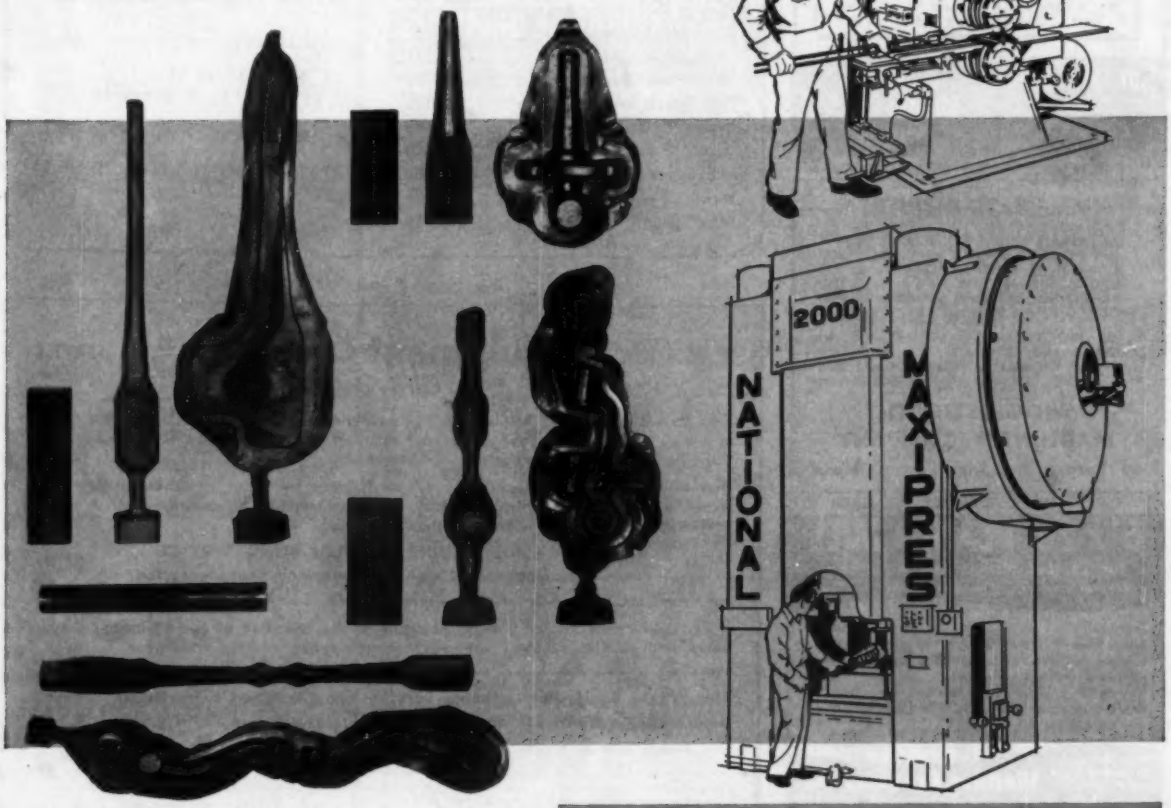


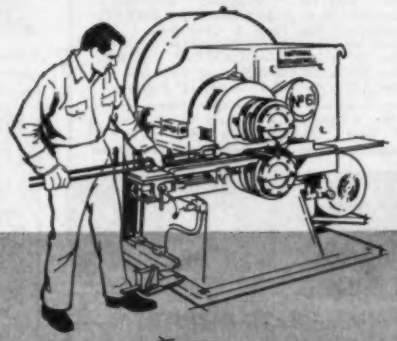
Modern forge plants around the world are using the method shown at right:

1. Prepare forging blanks in Reducerolls;
2. Finish forge in Maxipresses on the same heat.

Cost of making these forgings, and others, reduces by *one third* (even more!) thanks to modern engineering, latest-design equipment and proven methods.

Bring your prints or forgings to Tiffin. Let's discuss your plans for automatic or manual forging, but without obligation.





Founded 1874—DESIGNERS and BUILDERS of MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS CO-PIONEERS WITH INDUSTRY OF ADVANCED METALWORKING PRODUCTION METHODS

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U. S. A.

HARTFORD DETROIT CHICAGO

FALK
MACHINERY COMPANY

Every Item Guaranteed as Represented

Automatic: 2½", 8" CLEVELAND Model "A".
Brake Press: 6' x ⅛" CINCINNATI, 8' Bed.
Compressor, Air: 10, 15 HP GARDNER-DENVER.
Drill: 24" CINC-BICKFORD Super Service.
Drill: 2 Spindle No. 2LMS—24" LELAND-GIFFORD.
Drill: 6 Spindle No. 16 — 24" BUFFALO FORGE.
Drill: 3' x 9" CINC.-BICKFORD Radial.
Drill: 6' x 19" AMERICAN Radial.

14" x 16" x 60", 24" x 24" x 96" MATTISON Hyd. Surf. Grinders, 1943. Mag. chuck, Barnes Mag. Separater.

Grinder: 6" x 18" G & L Hyd. Surface.
Grinder: 4" x 12" LANDIS Type H Cyl., Hyd.
Grinder: No. 342 BESLY 30" Vert. Spindle Disc.
Jig Borer: No. 30A FOSDICK, 44" x 22" Table.
Keyseaters: No. 5 DAVIS, MITTS & MERRILL.
Lathes: 24", 36", 42", 54" BULLARD Vert. Turret, Side Hd., Turret Hd., MD, Spiral.
Lathes: No. 2, 4, 5, 2A WARNER & SWASEY, Preselector, Bar Feed & Chucking.
Lathes: No. 3, 7 BARDONS & OLIVER Turret.
Lathe: 20" x 16' AMERICAN Grd. Hd., MD.
Lathe: 24" x 28' HENDEY Grd. Hd., MD.
Lathe: 42" x 42' NILES G.H., 32' Centers.

No. 4 CINCINNATI Horiz. & #4 CINC. Vert. "DUAL POWER" Mills, 30 H.P.

BUY FROM STOCK — 10 WARD ST.
Telephone — ROCHESTER 5
BAKER 5-5887 — N. Y.

CIRCLE 601 READER SERVICE CARD

IMMEDIATE DELIVERY

2—#5 MINSTER HIGH SPEED O.B.I. BLANKING PRESSES, 45 ton, Flywheel type, 1½" stroke, 5 HP Varidrives, Speed range 150-300 SPM. Equipped with #4-6 Perfecto Double Roll Feed and Scrap Cutter. Never used. PRICE: F.O.B. East Boston ..... $11,076.00 each

2—#6 MINSTER O.B.I. PRESSES, 60 ton Geared type, 7" stroke, 12" shutheight, 7½ HP Varidrives, 40-80 SPM. Never used. PRICE F.O.B. East Boston ..... $9500.00 each

WIGGLESWORTH MACHINERY COMPANY
60 Border St., East Boston, Mass.

CIRCLE 603 READER SERVICE CARD

6' x 26' PLANER MILL
for Contour Milling and Kellering
Manufactured by Giddings and Lewis in 1953

Table is 6' w. x 26' lg., with 26' travel. (2) 100 HP heads have 4' under-rail, with fast and slow speed spindles for alum. or steel. Complete with optical measuring and electronic controls. For sale at small fraction of $350,000.00 U.S. Gov't cost. Send for detailed quotation with photos and general arrangements drawings.

We pay highest prices for your surplus machinery

Send for our illustrated Stock and Price List

Wender Presses, Inc.

TR. 2-1270 - Cable Address Wenderinc

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CIRCLE 602 READER SERVICE CARD

CUT TOOLING COSTS

Small Standard Drill Jig for short run jobs, or experimental parts, just add drill bushing and stops and you are ready for production. For information write to

INSTANT TOOLING CO.
3540 Ridge Road, Cleveland 2, Ohio

CIRCLE 604 READER SERVICE CARD

SEARCHLIGHT SECTION
ADVERTISERS' INDEX AND BUYERS' REFERENCE

Listed below are used, surplus new and rebuilt machine tools or services as advertised in this section.

The numbers after the advertiser's name indicates the products or services offered by the advertiser.

3. Automatics
7. Boring Mills
12. Compressors
17. Drilling & Reaming Machines
20. Fabricating Equipment
22. Forging Equipment
25. Gear Cutting Machines
26. Grinding Machines
30. Keyseaters
31. Lathes
32. Liquidating & Appraising Plants
33. Machine Tools
37. Milling Machines
45. Press Brakes
46. Presses
53. Saws
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50" x 41' centers LeBland Heavy Duty Lathe, two carriages, two tapers, 6 steady rests.
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For { 8-STATION PRODUCTION MACHINING
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CHUCKING
SINGLE POINT THREADING

Costs { $7,167.00 FOB Factory Complete with all standard equipment

This is an all new 1½" bar capacity ram type turret lathe with power feeds to all 8 working stations . . . that in addition to bar and collet work also has the versatility to do chucking, and when needed, single point threading. Powered by a 5 h.p., two-speed, geared motor, the new Sheldon 3 R turret lathe provides 16 spindle speeds, 60 different feeds to the carriage and cross-slide, and 180 different feeds to the ram turret.
The turret itself is ruggedly built and accurately machined to provide close tolerance indexing. And for complete ease of operation, it is put under power by simply pressing a push button on the control panel.

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For versatile, accurate machining in either long or short runs, the new Sheldon 3 R provides the answer to low investment cost with high profit operation.

New SHELDON
3R-TURRET LATHE

Write for bulletin with complete specifications and tooling data

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666 AXLE TIE-RODS Chamfered Per Hour

Another Example of D and T Production Engineering

Here's an interesting example of a special transfer machine using an indexing conveyor chain. Machine chamfers 1⅛" drilled holes on both ends (top and bottom) of rear axle tie rods. Conveyor chain and parts are indexed by air and parts are automatically unloaded. Although built for chamfering only, other similar operations can be incorporated on this basic machine design.

When you need high production with minimum machinery, call in a D & T production engineer. Most basically standard D & T machines can readily be tooled for economic special production.

OPERATION SEQUENCE: 1. Probe and stop machine if parts are not drilled through. 2. Locate from drilled hole and clamp. 3. Chamfer left-hand end. 4. Chamfer right-hand end. 5. Turn over 180°. 6. Chamfer left-hand end. 7. Chamfer right-hand end and automatically unload.

FREE DATA For more examples of outstanding production machine tools, write for Bulletin No. 1002.

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GRANT

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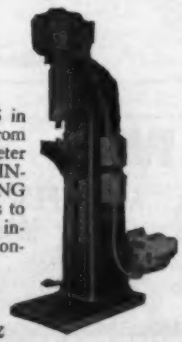

THE GRANT MFG. & MACHINE CO.

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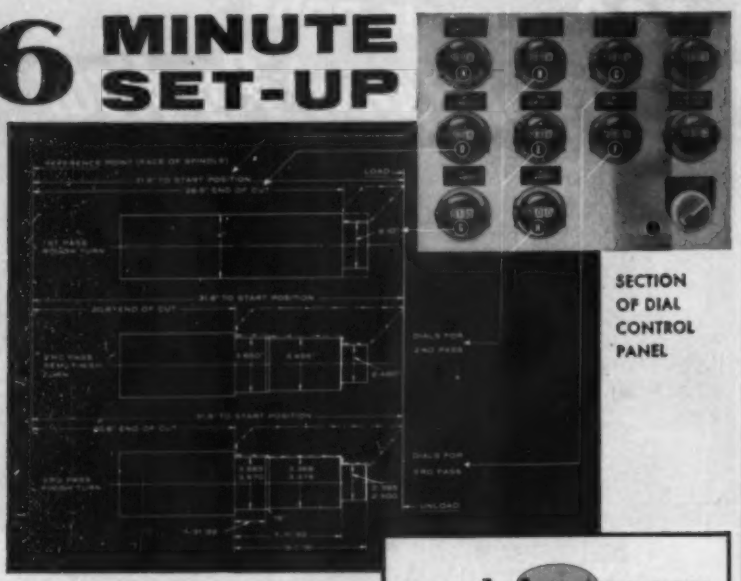
6 MINUTE SET-UP



SECTION OF DIAL CONTROL PANEL

SIMPLY DIAL YOUR SET-UP and the Seneca Falls Model Q Lathe is producing. Above is the geometry of a simple turning operation requiring three passes. First, dial the starting position of the cut (dials A, B, C); second, dial end of cut (dials D, E, F); and third, dial the 3.10" roughing diameter (dial G). Dial H is set at 0.00 since the second pass is a bias (oversize) cut made with tracer-template control. The tracer-template also controls the finish turn so no dial setting is necessary. Now set the selector switch I for three passes.

Machine set-up now complete; press the "cycle-start" button and you're in production. Write for Bulletin No. Q-59.

model Q tracer lathe features

- "Dial Your Set-up System" simplifies changeover.
- Multiple tools rough and tracer tools finish turn in one automatic cycle.
- Mechanical feed to all carriages.
- Templates clear of chip area.
- Easy to load and unload.
- Straight line diameter adjustment for tracer tools.
- Four speed headstock available with automatic speed change.
- Feed rate can change during cutting cycle.

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DO tell us your troubles. If turning, centering or automation are involved, most likely we can do more than sympathize

SENECA FALLS, MACHINE CO.
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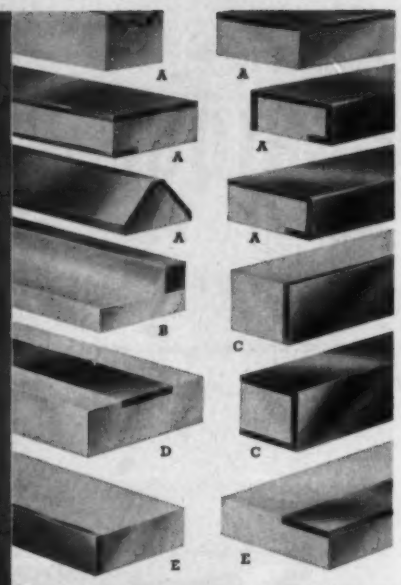

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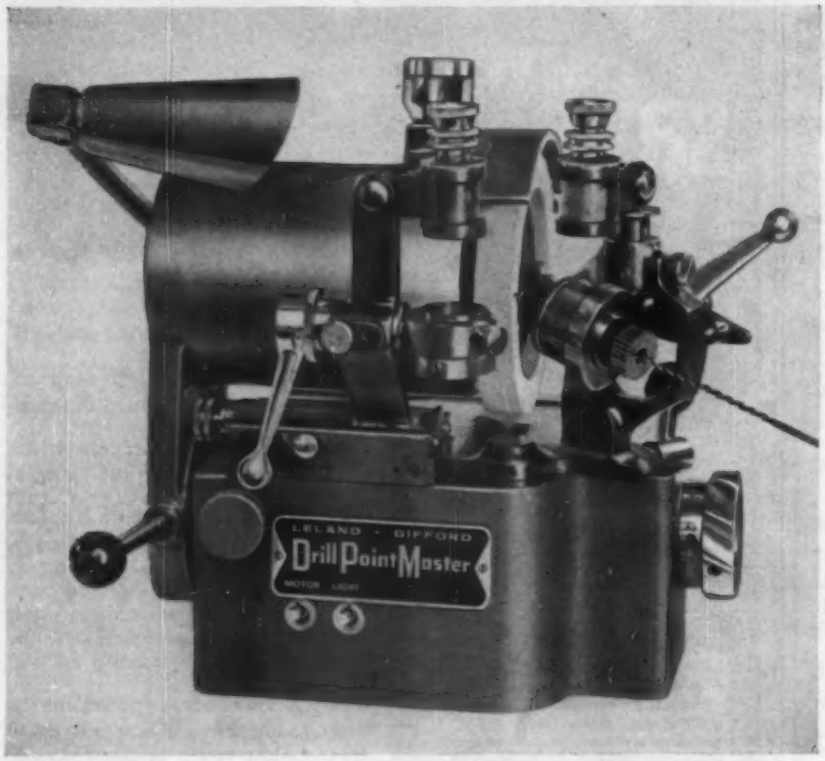

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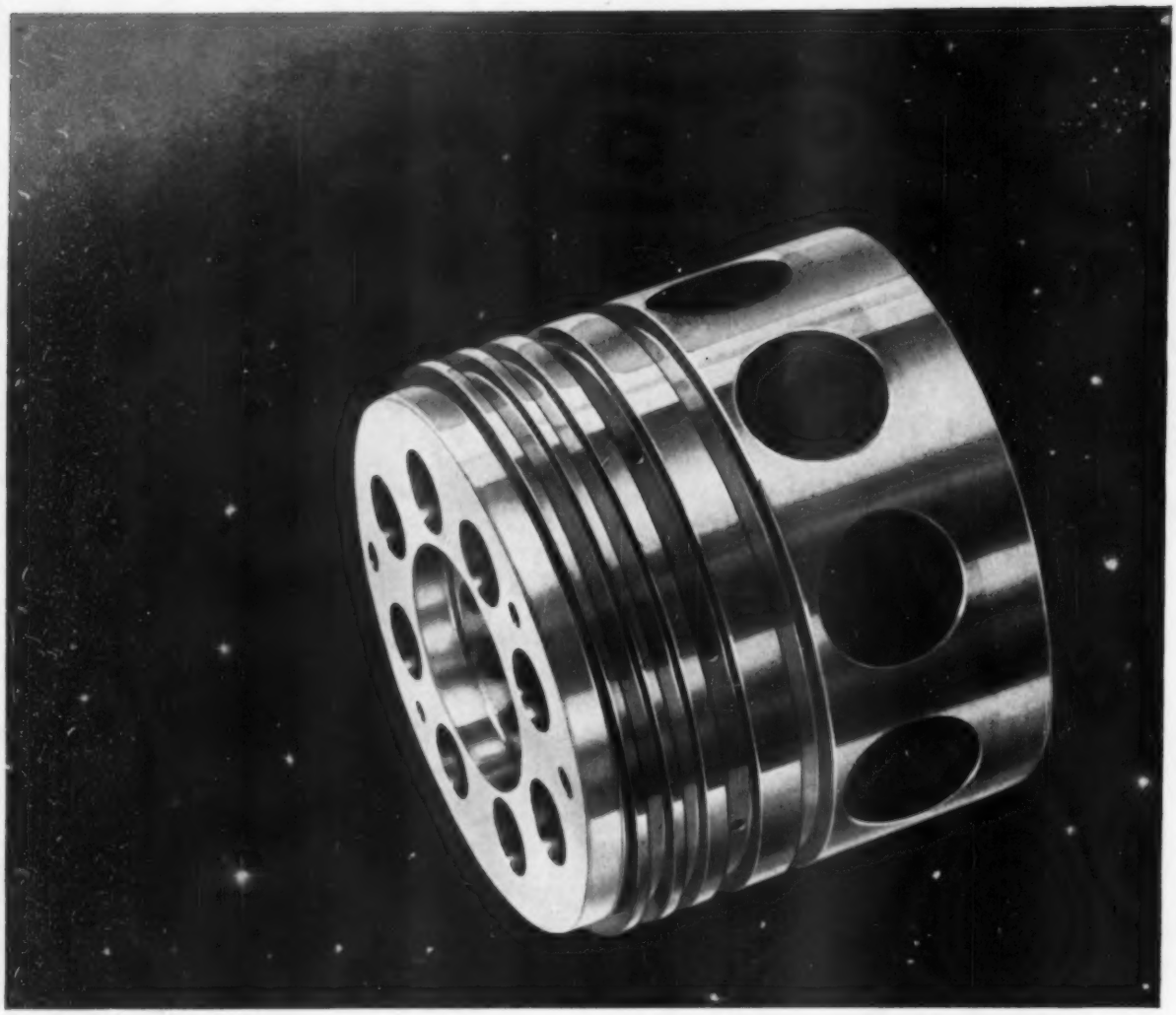

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